

CASUALTY CARE AND CBR WARFARE

As a dental assistant, your training in basic life support and emergency medical treatment makes you a vital resource in mass casualty situations. In such situations, you will be expected to assume the role of a medical aid person, to provide basic life support and emergency medical treatment, to sustain life, and to prevent further injuries. You can be called to these duties during either peace or wartime situations. This chapter explains your roles in (1) mass casualty situations and (2) chemical, biological, and radiological (CBR) casualty situations.

To meet these needs, we will explain procedures for providing emergency medical (first aid) treatment in a mass casualty and CBR situation.

GENERAL MASS CASUALTY GUIDELINES

The general guidelines for dealing with mass casualty situations are as follows:

- Assess the site.
- Assess the condition of casualties.
- Perform basic life support.
- Treat the obvious conditions.
 1. Control external hemorrhage.
 2. Treat for shock.
 3. Immobilize fractures.
 4. Dress wounds.
- Perform a secondary examination.
- Prepare casualties for transport.
- Transport casualties to a safe area.

In the following sections, the guidelines are explained.

ASSESSMENT

You must make a quick and accurate assessment of the site and of the immediate condition of the casualties.

Site Assessment

Before you attempt to rescue or to administer emergency treatment, it is essential that you assess the conditions at the casualty site to ensure that it is safe for both you and the casualty.

Consider all aspects of the casualty site and the environment to determine the probability of success if a rescue is attempted. This assessment should include:

- Accessibility of the casualty site. Can the site be reached with available equipment? Once reached, can emergency treatment be rendered on site? Can the casualty be removed from the site if immobile?
- Safety of the casualty site. Is the site stable? Can you move safely at the site? Is the site exposed to hostile fire? In case of an unforeseen emergency, can you and the casualty be rescued from the site?
- Environmental conditions at the site. Is there adequate, breathable air at the site to sustain both the rescuer and the casualty? Are there poisonous or dangerous substances in the area? Will weather conditions hamper an attempted rescue?

Casualty Assessment

During the initial or preliminary casualty assessment, you will perform a primary examination of the casualty to determine if injuries are life-threatening.

Basic rules for casualty assessment are as follows:

1. Keep the casualty lying down, with the head level with the body, until you have found out what kind of injury the person has and how serious it is. The following problems require that you place a casualty in different positions:

a. Vomiting, bleeding about the mouth, or semiconscious. If the casualty is in danger of sucking in blood, vomited matter, or water, place the patient on the side, or back, with the head turned to one side, lower than the feet.

b. Shortness of breath. If the casualty has a chest injury or has breathing difficulties, place the patient in a sitting or semi-sitting position.

c. Shock. If the casualty is in shock, place the patient on the back, with the head slightly lower than the feet. If the injuries permit, the casualty's feet should be raised and supported 6 to 12 inches above the head.

2. Move the casualty only when absolutely necessary. You may have to remove some clothing to determine the extent of the injuries. Remove enough clothing to get a clear idea of the extent of the injury. If you remove clothing incorrectly, you may do great harm, especially in fracture injuries. You may have to rip or cut clothing along the seams. When clothing is removed, ensure that the casualty does not become chilled. Shoes may have to be cut off to avoid causing pain or increasing an injury.

3. Reassure the casualty and keep the patient as comfortable as possible.

4. Do not touch open wounds or burns with the fingers or other objects except when sterile compresses or bandages are not available and it is absolutely necessary to stop severe bleeding.

5. Do not try to give an unconscious person any solid food or liquid substance by mouth.

6. If a bone is broken, or if you suspect that one is broken, do not move the casualty until you have immobilized the injured part. When transporting a casualty, always make sure that the litter is carried feet forward no matter what the injuries are. This enables the rear litter bearer to observe the casualty for any respiratory obstruction or stoppage of breathing.

7. Keep the casualty comfortable and warm enough to maintain normal body temperature.

If the casualty is conscious and coherent, the primary assessment can be expedited by asking about the nature of the injuries and the conditions involved. You must rely on an unconscious casualty's signs (e.g., profuse hemorrhage, cyanotic skin, choking, etc.) and on surroundings.

Triage

Triage is the sorting of and allocation of treatment to patients, especially battle and disaster victims, based on a system of priorities designed to maximize the number of survivors.

Triage is normally the responsibility of the medical officer, dental officer, or Hospital Corpsman. But if they are not available, you will have to triage the casualties. Sorting decisions may be made at every stage in the movement of the wounded. Your goal in making these decisions is to do the most good for the largest number of casualties, given limited time, supplies, and personnel.

Casualties are grouped according to the seriousness of their injuries. The groups are as follows:

Group 1	Those whose injuries are so slight they can be managed by self-help or buddy care. These casualties can be returned promptly to their units for full duty.
Group 2	Those whose wounds require medical care but are so slight that they can be managed at the battalion aid station. These casualties can be returned to duty after a brief period.
Group 3	Those whose injuries demand surgical attention immediately, after resuscitation, or as soon as practical.
Group 4	Those hopelessly wounded or dead on arrival.

The treatment order of the groups depends on whether it is a combat or noncombat situation.

- **Combat.** This occurs when you are up against hostile, life-threatening situations (e.g., war, bombings, terrorist dealings, etc.). In the combat situation, you will triage the casualties in the group order of 1, 2, 3, and 4. This is done because Group 1 casualties must return to full duty as soon as possible to help fight the enemy, followed by Groups 2 and 3 when they are available. Because Group 4 casualties are hopelessly wounded or dead, they will be last.

- **Noncombat.** This occurs when a disaster strikes (e.g., plane crash, automobile accident, earthquake, flood, etc.). In these situations, the least injured casualties (Groups 1 and 2) can care for themselves while you take care of the wounded in Group 4. In a noncombat situation there is usually no further life-threatening action, so you will have time to treat a Group 4 casualty who has a chance of survival. After you are done with Group 4, go back and treat Group 3, Group 2, and then Group 1.

BASIC LIFE SUPPORT

In any casualty situation, you will concentrate on maintaining the ABCs (discussed in the “Basic Life Support” section of chapter 9 in *Dental Technician, Volume 2*, NAVEDTRA 12573) of the casualties.

TREATING OBVIOUS CONDITIONS

In your primary assessment, you will notice some obvious conditions that require treatment (e.g., external hemorrhaging, shock, fractures, wounds, etc.). After you triage the casualties, you will start treatment of the obvious conditions.

Hemorrhage

Hemorrhage, or bleeding, occurs whenever there is a break in the wall of a blood vessel. Blood circulates throughout the body by means of three different kinds of blood vessels: arteries, veins, and capillaries.

Arteries are large blood vessels that carry the blood away from the heart. Veins are large blood vessels that carry blood back to the heart. Capillaries are smaller blood vessels that form a connecting network between the arteries and veins.

Arterial bleeding is when bright red blood comes from the wound. If the artery is near the surface of the body, the blood will spurt out each time the casualty's heart beats. If the artery is located deep within the body, the blood will flow from the wound in a steady stream.

Venous bleeding is when dark red blood comes from the wound in a steady stream.

Capillary bleeding is when dark red blood comes from the wound in a steady stream.

Slight wounds usually cause only capillary bleeding. This bleeding can be controlled by lightly fastening a sterile dressing over the wound. Deeper wounds, however, may cause venous or arterial bleeding. Because the veins and arteries are large blood vessels, a casualty may lose a lot of blood.

You should regard venous or arterial bleeding as a serious, life-threatening emergency.

The four methods for controlling hemorrhage are direct pressure, elevation, applying pressure to the pressure points, and the use of a tourniquet.

WARNING

Apply a tourniquet only as a last resort.

DIRECT PRESSURE.—In most cases, serious external bleeding can be controlled by applying pressure directly on the wound with your hand on a sterile dressing as shown in figure 13-1.

A battle dressing is a combination dressing and bandage in one unit. It is made of many layers of gauze sewed to a muslin strip or strips. Emergency medical kits are supplied with battle dressings (fig. 13-2), each stored in a sterile package, ready for instant use. These dressings come in different sizes; select a size to completely cover the wound and extend at least 1 inch in every direction beyond the border of the wound. Make sure that the sterile side covering the wound does not come into contact with your fingers, your clothes, or other unsterile objects. Do not drag the dressing across the casualty's skin, or allow it to slip out of place once it has been positioned over the wound.

When the dressing is in place over the wound, apply pressure to the dressing with the palm of your hand. Maintain pressure until the bleeding is controlled. If blood soaks through the dressing, do not replace it; add a second dressing on top of the first one and maintain hand pressure.

When the bleeding is controlled, wrap the ends of the dressing around the wound and secure them by tying or pinning.

If you have no battle dressings, you may use the cleanest cloth available (e.g., freshly laundered handkerchief, towel, or shirt) and a roller bandage (fig. 13-3). But never use material that will stick to the wound and be difficult to remove (e.g., absorbent cotton and adhesive or friction tape). The roller bandage is used to hold a compress in place, create pressure, and immobilize joints. The purpose of the bandage is to stop the bleeding, to prevent further



Figure 13-1.—Direct pressure.

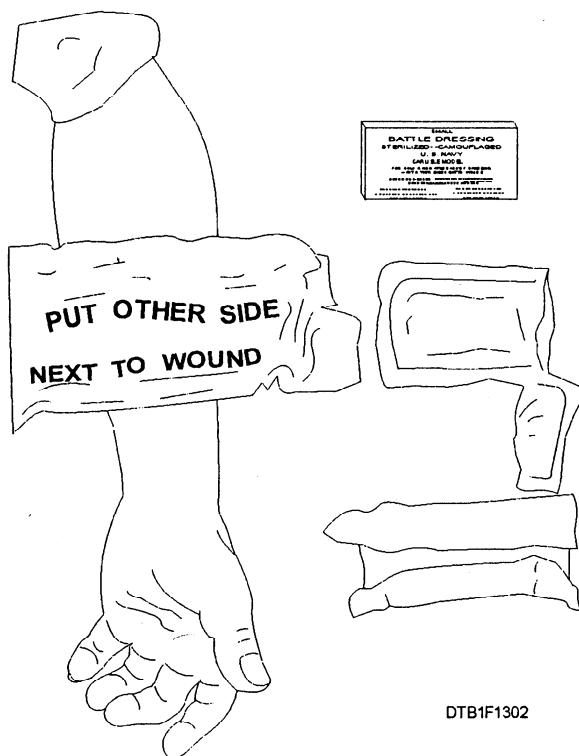
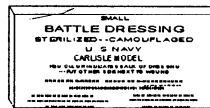
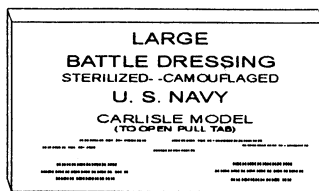


Figure 13-2.—Battle dressings.

contamination, and to prevent further injury to the wound.

When the dressing is in place, treat the casualty for shock and complete the U.S. Field Medical Card, DD Form 1380. In cases of severe hemorrhage, do not worry about the dangers of infection. Although the prevention of infection is important, your main concern is to stop the flow of blood. If there is no material available, simply thrust your hand over the wound.

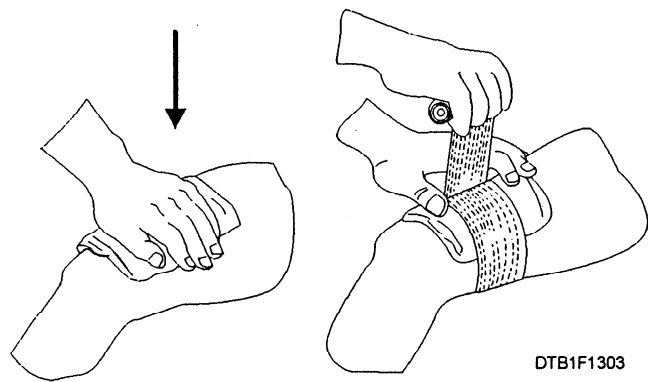


Figure 13-3.—Direct pressure to control bleeding and application of a roller bandage.

ELEVATION.—Elevating or raising an injured limb above the level of the heart will help to control bleeding. Elevation should be used together with direct pressure (fig. 13-4). If you suspect a fracture, do not elevate a limb until the fracture has been splinted and you can be reasonably certain that elevation will cause no further injury. Use a stable object to maintain elevation.

PRESSURE POINTS.—If direct pressure and elevation fail to control serious external bleeding, try to control it by applying pressure to the appropriate pressure point.

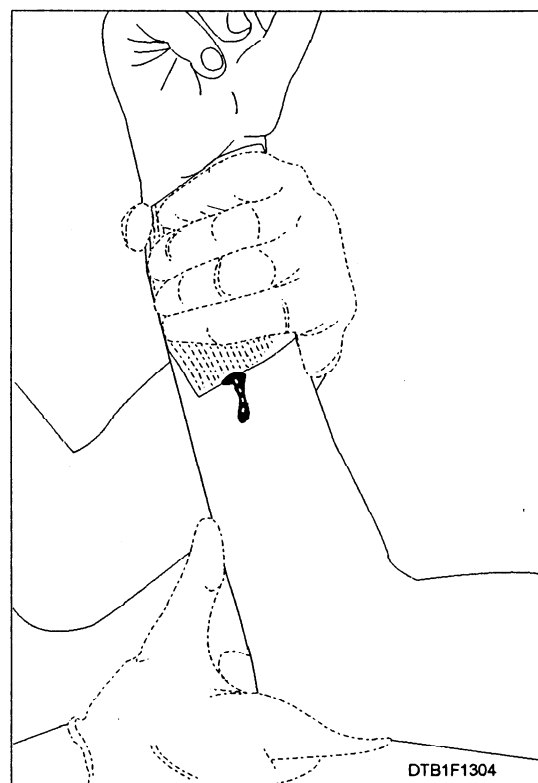


Figure 13-4.—Combination of direct pressure and elevation.

A pressure point is located where an artery passes over a bone near the surface of the skin. By exerting pressure with your fingers or hand at this point, you will compress the artery against the bone, thus shutting off most of the blood flow to the injured part. There are

22 principal pressure points, 11 on each side of the body. Figure 13-5 shows pressure points for the **right** facial, subclavian, brachial, radial and ulnar, iliac, and anterior and posterior tibial arteries. There are corresponding pressure points in the same locations on

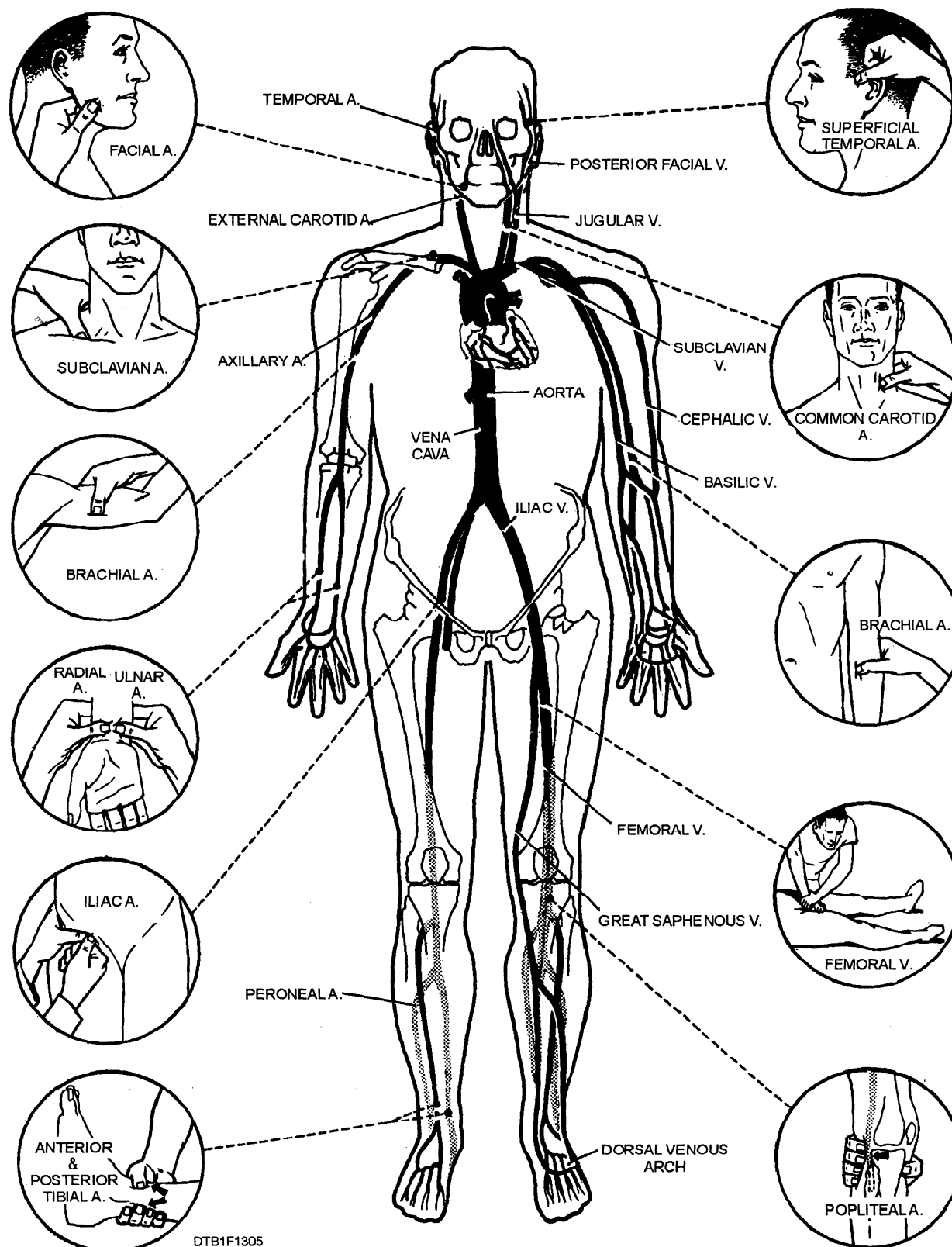


Figure 13-5.—Principal pressure points.

the left side of the body. This figure also shows pressure points for the **left** superficial temporal, common carotid, brachial, femoral, and popliteal arteries.

Whether you use a pressure point on the left side or the right side of the casualty depends on the side where the wound is found. You must also select the pressure point that is **nearest the wound, and between the wound and the main part of the body**.

The following paragraphs discuss the pressure points used to control hemorrhage in different areas of the body. Throughout the discussion, refer to figure 13-5.

For bleeding of the **temple, forehead, and scalp**, apply pressure to the superficial temporal artery just in front of the upper part of the ear.

For bleeding of the **cheeks, lips, or chin**, apply pressure to the facial artery. To find the pressure point, start at the angle of the mandible until you feel a small notch. The pressure point is in this notch.

For bleeding of the **neck**, apply pressure to the common carotid artery on the side of the neck. You can detect a very strong pulse. At a point below the wound, press inward and slightly backward against the pressure point.

WARNING

Do not use this pressure point unless it is absolutely necessary, because there is great danger of compressing the windpipe and choking the casualty. **Never** apply pressure to the pressure points on both sides of the neck at the same time.

For bleeding at the **shoulder and upper part of the arm**, apply pressure to the subclavian artery under the front part of the collarbone. You can press down against the first rib or forward against the collarbone.

For bleeding **between the middle of the upper arm and the elbow**, apply pressure to the upper portion of the brachial artery on the inner side of the arm, about halfway between the shoulder and the elbow.

For bleeding **between the middle of the upper arm and the elbow**, apply pressure to the upper portion of the brachial artery on the inner side of the arm, about halfway between the shoulder and the elbow.

For bleeding of the **lower arm** (forearm), apply pressure to the lower portion of the brachial artery on the inner side of the arm at the bend of the elbow.

For bleeding of the **hand**, apply pressure to the radial and ulnar arteries at the wrist.

For bleeding at the **thigh**, apply pressure to the iliac artery in the middle of the groin. It may be more effective to apply pressure to the femoral artery in the upper thigh. If you use this pressure point, apply pressure with the closed fist of one hand and use the other hand to give additional pressure. The femoral artery at this point is deeply buried, so great pressure is needed to compress the artery against the bone.

For bleeding of the **lower leg**, apply pressure to the popliteal artery on the back of the leg, behind the knee. If you are unable to apply enough pressure with your fingers, hold the front of the knee firmly with one hand. With your other hand, make a fist and thrust it firmly against the back of the knee.

For bleeding of the **foot**, apply pressure to the anterior and posterior tibial artery at the ankle.

It is difficult to maintain pressure on a pressure point for more than 15 minutes. If you find you are no longer able to maintain pressure and there is no one to relieve you, you must find another way to control the bleeding. A dressing fixed securely over the wound may be enough.

If this controls the bleeding, treat the casualty for shock and then complete the U.S. Field Medical Card. If you are unable to control the serious bleeding with the dressing, and if the wound is in one of the extremities (arms or legs), you may have to apply a tourniquet.

TOURNIQUETS.—Tourniquets are used as a **last resort**, and then only for controlling bleeding in the extremities. If you cannot control serious bleeding in an extremity by applying direct pressure, elevation, or by using the appropriate pressure point, you may apply a tourniquet. You will **rarely** have to apply a tourniquet. When you do, it will most likely be a situation when part of an extremity is amputated (cut off).

A tourniquet consists of a pressure pad, a band, and a device for tightening the band. Place the pressure pad over the main artery supplying blood to the injured extremity. Wrap the band around the extremity and over the pressure pad. Tighten the band only enough to shut off the supply of blood to the injured extremity.

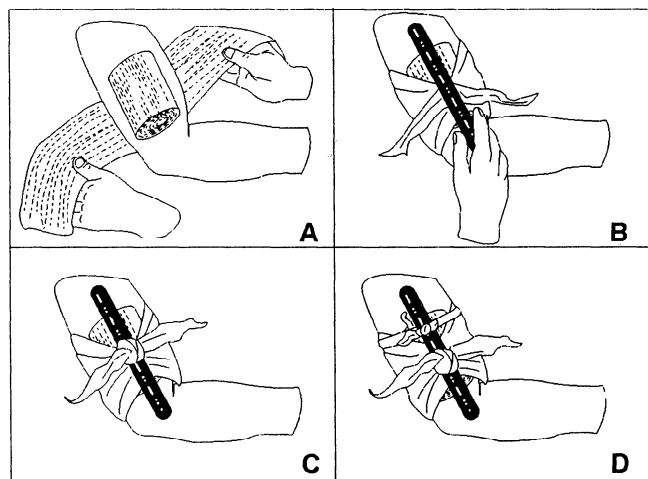
You may use a rolled compress, battle dressing, or bandage as a pressure pad. If the materials are not available, you may use any round, smooth pressure object, such as a rolled handkerchief, a flat stone, or a rifle shell. If no pressure object can be found, apply the band without it.

You may use any long, flat material, (i.e., bandage, belt, stocking, strip of rubber, or necktie) as the tourniquet band. The band **must** be flat. **Narrow materials such as rope, wire, or string should not be used;** they will cut into the casualty's flesh.

Most Navy emergency medical kits contain a webbed band with a buckle on it. The band is tightened by pulling one end through the buckle. This eliminates the need for a separate device to tighten the band. If you are using another type of band, you may use a small, short stick to tighten it.

There are some general rules to keep in mind when applying a tourniquet. Apply it over a main artery **between the wound and the main part of the body**. Apply the tourniquet as close to the wound as possible, making sure that the tourniquet is not touching the wound and that it is not placed over a joint. Once a tourniquet is correctly applied, only experienced medical personnel may loosen or remove it. Refer to figure 13-6 and use the following steps to apply a tourniquet:

1. Place the pressure pad or similar pressure object over the main artery supplying blood to the injured extremity (see A in fig. 13-6).



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Figure 13-6.—Steps in tourniquet application.

2. Wrap the band once around the extremity and over the pressure pad. Place a short stick on the crossing band (see B in fig. 13-6).

3. Knot the band over-the-stick (see C in fig. 13-6).

4. Twist the stick to tighten the tourniquet just enough to control the flow of blood. Do not make it any tighter than necessary. A tourniquet that is too loose will not control the bleeding; one that is too tight may further injure the extremity.

5. Tie the stick in place with a strip of bandage or other material (see D in fig. 13-6).

If bleeding fails to stop after the band has been tightened, there is a good chance the pressure pad is not placed directly over the artery. If this is the case, loosen the tourniquet and reposition the pad.

After you have brought the bleeding under control, place a sterile dressing securely over the wound. **Do not cover the tourniquet with a dressing. Do not loosen the tourniquet.** Again, once a tourniquet has been correctly applied, only experienced medical personnel may loosen or remove it.

After placing the dressing, treat the casualty for shock. Finally, complete the field medical card. In addition, write the letter "T" and the time the tourniquet was applied (e.g., T-0830) on the casualty's forehead. Use a skin pencil, colored antiseptic, ink, or crayon for this purpose.

Shock

Review the shock section in chapter 9, *Dental Technician, Volume 2*, NAVEDTRA 12573, for causes, signs, symptoms, and treatment of basic shock, fainting, anaphylactic shock, and insulin shock.

Shock may develop at the time of the injury or hours later. **Never** put off treating a casualty for shock until the signs and symptoms appear. Begin treatment immediately. If shock has not yet developed, the treatment may prevent it from developing. If shock has already developed, the treatment may prevent it from becoming worse.

TREATMENT OF SHOCK.—To prevent shock or to treat shock that has already developed, you should position the casualty, conserve body heat, and relieve pain.

Position the Casualty.—The casualty should be lying down. Never let that person sit up, stand, or walk around. Generally, the standard position for the shock casualty is lying on the back with the feet elevated 6 to

12 inches (fig. 13-7). You must consider the type of injury before deciding on the position. The casualty's injuries may prevent you from using the standard position. For example, if a person with a chest wound has trouble breathing, you will raise the head slightly, and place the patient in a sitting or semi-sitting position. If a casualty is vomiting or bleeding around the mouth, place the patient on the side or back with the head turned to one side and lower the feet. If the face is flush rather than pale, or if you have any reason to suspect head injury, do not raise the feet. Instead, keep the head level with or slightly higher than the feet. If the casualty has broken bones, you must judge the best position for both the fractures and for shock. A fractured spine must be immobilized before the casualty is moved at all to avoid further injuries. A helpful mnemonic: If the face is red, raise the head; if the face is pale, raise the tail (feet).

Conserve Body Heat.—Loss of body heat can cause shock to develop or to become worse. Keep the casualty warm. Cover the patient with blankets or any dry material. Do not overheat the casualty.

Relieve Pain.—Pain is a major cause of shock. Treatment of injuries will often reduce pain. Pain may also be relieved by slightly repositioning the casualty. Under mass casualty conditions, you may have to administer morphine to certain types of casualties to relieve pain. The condition under which morphine may be administered will be discussed in the Morphine Administration section. **Morphine must never be administered if there is evidence of severe or worsening shock.**

Injuries to Bones, Joints, and Muscles

Injuries to bones, joints, and muscles are some of the most common situations that you will encounter. These injuries can range from the simple to the critical and life threatening. Whether the injury is mild or severe, your ability to provide quick and efficient emergency care may prevent further pain and injury.

An essential part of emergency treatment for fractures consists of immobilizing the injured part with splints so the sharp ends of broken bones will not move around and cause further damage to nerves, blood vessels, or vital organs. Splints are also used to immobilize severely injured joints or muscles and to prevent the enlargement of extensive wounds. You must have a general understanding of the types and uses of splints.

SPLINTS.—Whether ready made or improvised, splints must fulfill certain requirements. They should be lightweight, but must be strong and fairly rigid. They should be long enough to reach the joints above and below the fracture. Splints should be wide enough so that the bandages used to hold them in place will not pinch the injured part.

Splints must be padded on the sides that touch the body; if they are not properly padded, they will not fit well and will not adequately immobilize the injured part. If you have to improvise the padding for a splint, you can use articles of clothing, bandages, cotton blankets, or any other soft material. If the casualty is wearing heavy clothes, you may be able to apply the splint on the outside, allowing the clothing to serve as part of the required padding.

To apply a splint to an injured part, fasten it in place with bandages, strips of adhesive tape, articles of clothing, or any other available material. If possible, one person should hold the splint in position while another person fastens it. Figure 13-8 shows a properly placed splint for a fractured femur.

Although splints should be applied snugly, they should **never** be tight enough to interfere with blood circulation. Remember to leave the fingers or toes exposed. If the tips of the fingers or toes become blue or cold, you will know that the splint or bandages are too tight. You should examine a splinted part approximately every half hour, and loosen the fastenings if the circulation appears to be impaired.

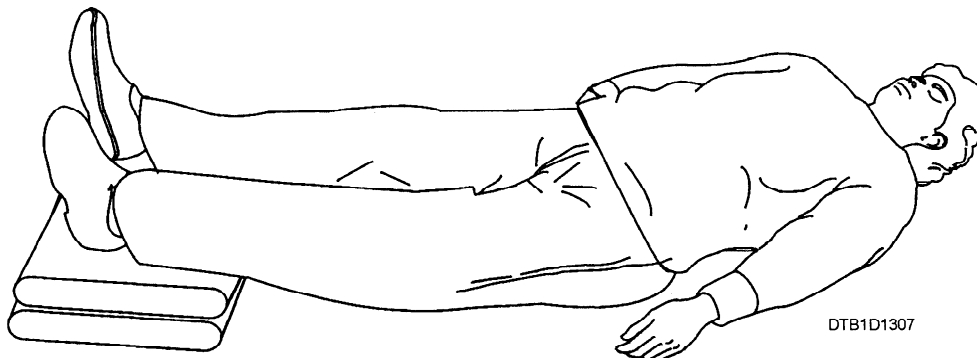
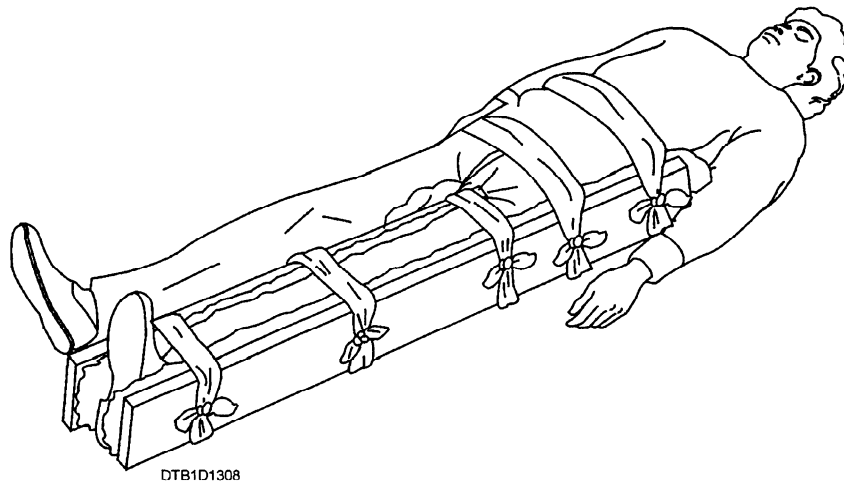


Figure 13-7.—Position of casualty for treatment of shock.



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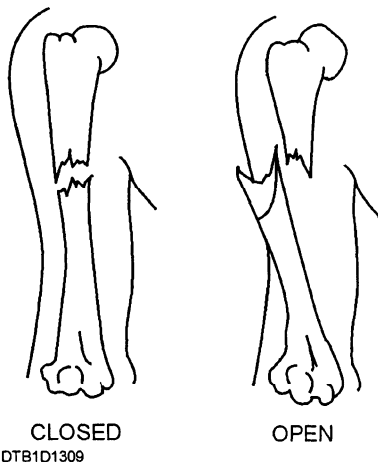
Figure 13-8.—Splint for a fractured femur.

Remember that any injured part is likely to swell, and splints or bandages that are all right when applied may later be too tight.

FRACTURES.—A break in a bone is called a *fracture*. There are two main types of fractures. A *closed fracture* is internal where the bone is broken but there is no break in the skin. With an *open fracture*, there is an open wound in the tissues and the skin where the bone has broken through. This type of break and wound is also referred to as a *compound fracture*. Figure 13-9 shows closed and open fractures.

When providing emergency medical treatment to a person who has suffered a fracture, you should follow these general rules:

1. If there is any possibility that a fracture has been sustained, treat the injury as a fracture.
2. Get medical aid at the first possible opportunity. All fractures require medical treatment.
3. Do not move the casualty until the injured part has been splinted.



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Figure 13-9.—Closed and open fractures.

4. Treat for shock.

5. Do not attempt to locate a fracture by grating the ends of the bone together.

6. Do not attempt to set a broken bone.

7. When a long bone in the arm or leg is fractured, the limb should be carefully straightened so splints can be applied. Never attempt to straighten the limb by applying force or traction. Pulling gently with your hands in the direction of the long axis of the limb is permissible, and may be all that is necessary to get the limb back into position.

8. Apply splints. If the casualty is to be transported only a short distance, or if the patient will be seen very soon by a medical officer, it is probably better to leave the clothing on and place emergency splinting over it. If the casualty must be transported for some distance, or if a considerable period of time will elapse before the patient can be treated by a medical officer, it may be better to remove enough clothing so that you can apply well-padded splints directly to the injured part.

9. If the fracture is open, you must take care of the wound before you can treat the fracture.

SPRAINS.—A sprain is an injury to the ligaments that support a joint. A sprain usually involves a momentary dislocation, with a bone slipping back into place on its own accord.

Tearing of supporting ligaments is probably the most serious part of a sprain, but there is also a considerable amount of damage to the blood vessels and other soft tissues that surround the joint. When the blood vessels are damaged, some blood may escape into the joint itself and into the tissues. This causes the severe pain and marked swelling characteristic of a sprain.

Immobilize the injured joint with some type of splint or with a snugly fitting adhesive or elastic bandage. Remember that the injured part may continue to swell, so a bandage that is loose enough when applied may soon become too tight.

Elevate the injured part, if possible. This helps reduce the pain and swelling.

It is difficult to tell a sprain from a fracture. If you are not sure which injury is present, always treat it as a fracture until the casualty has been brought under the care of a medical officer.

STRAINS.—An injury caused by the forcible overstretching or tearing of a muscle or tendon is known as a *strain*. Strains may be caused by lifting excessively heavy loads, by sudden movements, or by any other action that pulls the muscles beyond their normal limits.

The chief symptoms of a strain are pain, lameness, stiffness (sometimes involving knotting of the muscles), moderate swelling at the place of injury, and discoloration because of escape of blood from the injured blood vessel into the tissue. Have the patient rest the injured part. If the injured muscle is in the arm or leg, elevate the part.

Wounds

Wounds may be classified according to their general condition, size, location, the manner in which the skin or tissue is broken, and the agent that caused the wound. You must usually consider some or all of these factors to determine what emergency treatment is necessary for a wound. There are six types of wounds: abrasion, incision, laceration, puncture, avulsion, and amputation.

ABRASIONS.—Abrasions are made when the skin is rubbed or scraped off. Rope burns, floor burns, and skinned knees or elbows are common examples of abrasions. This kind of wound is easily infected because dirt and germs are usually ground into tissues. There is usually minimal bleeding or an oozing of clear fluid.

INCISIONS.—Incisions, commonly called cuts, are wounds made by sharp cutting instruments such as knives, razors, or broken glass. Incisions tend to bleed freely because the blood vessels are cut straight across. There is relatively little damage to surrounding tissues. Of all the classes of wounds, incisions are the least likely to become infected, because the free flow of blood washes the wound.

LACERATIONS.—These wounds are wounds that are torn, rather than cut. They have ragged,

irregular edges and masses of torn tissue underneath. These wounds are usually made by blunt force, rather than sharp objects. They are often complicated by crushing of the tissues as well. Because lacerations are frequently contaminated with dirt, grease, or other material that is ground into the tissues, they are very likely to become infected.

PUNCTURES.—Punctures are caused by objects that penetrate deeply into the tissues but leave a relatively small surface opening. Wounds made by nails, needles, wire, knives, and bullets are usually punctures. A puncture wound can be classified as penetrating or perforating. A perforation differs from a penetration in that it has an exit as well as an entrance site.

As a rule, small punctures do not bleed freely. But, large puncture wounds may cause severe internal bleeding. The possibility of infection is great in all puncture wounds.

AVULSIONS.—An avulsion is the tearing away of tissue from a body part. Bleeding is usually heavy. The torn tissue may be surgically reattached in certain situations. It can be saved for medical evaluation by wrapping in cool, moist toweling and rushing it, along with the victim, to a medical facility.

AMPUTATIONS.—A traumatic amputation is the nonsurgical removal of a limb. Bleeding is heavy and requires a tourniquet. Shock is certain to develop. The limb can often be successfully reattached. Wrap the limb in a cool, moist towel and transport to medical as soon as possible.

HEAD WOUNDS.—Head wounds can be open or closed. In open head wounds, there is an obvious injury. Closed head wounds may not be obvious, so you may have to base treatment on the history of how the accident happened. You may see only the delayed symptoms, such as a seizure, disorientation, or drastic personality changes.

In all injuries to the skull, check for these signs of an injury to the brain:

- Unequal size of the pupils
- Deformity of the skull
- Blood or sticky fluid coming from the ears and nose

Any time there is blunt trauma to the skull, keep the casualty's neck immobilized in case there is damage to the spine or the neck area.

The emergency care of an individual with a head injury consists of the following:

1. Maintain an open airway.
2. Control the bleeding.
3. Cover skull wounds with sterile dressings.
4. Keep the casualty lying down.
5. Give no medications.
6. If necessary, administer cardiopulmonary resuscitation (CPR).

When controlling bleeding, do not use direct pressure or tie any knots over the wound. If there is a skull fracture, you would not want to force parts of the skull into the brain. When laying a person down, try to keep the head slightly elevated. If there is an injury to the back of the head or bleeding into the throat and mouth, position the casualty on his side so that blood can drain out of the mouth, not down the throat. (Try to keep the neck stiff.) Never raise the feet of a head injury victim.

CHEST WOUNDS.—All chest injuries are serious. They can cause severe breathing and bleeding problems. Any casualty showing signs of difficulty in breathing without signs of airway obstruction must be inspected for chest injuries. One of the most serious chest injuries is the **sucking chest wound**. This is a penetrating injury to the chest that produces a hole in the lung, causing the lung to collapse, and thus preventing normal breathing. Immediate medical aid must be provided. The sucking chest wound will result in death if not treated quickly.

A casualty with an open chest wound gasps for breath, has difficulty breathing out, and may have a bluish or grayish color to his face. When you remove clothing over the area, you may or may not hear a sucking sound at the wound site. Frothy blood may bubble from the wound during breathing.

To treat a casualty of a sucking chest wound:

1. Remove any clothing from the chest area.
2. Immediately seal the wound with your hand or any nonporous (airtight) material such as aluminum foil or plastic wrap (cellophane).
3. Wipe the blood from the surrounding skin while holding the airtight material over the wound. Apply tape (wide and nonporous, if possible) to all sides of the material, leaving one corner of the dressing unsealed.

This procedure allows trapped air to escape when the casualty exhales and prevents air entry when the casualty inhales.

4. Give the casualty oxygen if it is available. If a lung is injured, more oxygen will be needed to compensate for the injury.

5. Place the casualty on the wounded side unless there is back injuries. By placing the patient on the wounded side, you will keep the good lung up so breathing will be easier. If the casualty is having difficulty breathing while on the wounded side, you can place him/her in a sitting position. This may help to make breathing easier.

6. Watch the casualty closely for signs of respiratory difficulty or shock. Treat accordingly.

7. Do not give a casualty with chest injuries anything to eat or drink.

8. Immediately transport the casualty, wounded side down, to a medical facility.

The procedures described above are also followed when treating a lung injury from the casualty's back.

ABDOMINAL WOUNDS.—Many vital organs are located in the abdominal area, so a deep wound in the abdomen is likely to constitute a major emergency. Abdominal wounds usually cause intense pain, nausea and vomiting, spasms of the abdominal muscles, and severe shock. Immediate surgical treatment is almost always required, so the casualty must receive medical attention at once. Give only the most essential treatment, and concentrate your efforts on getting the casualty to a medical facility.

The general procedures for treating an abdominal wound are as follows:

1. Keep the casualty lying on his/her back. If the intestine is protruding or exposed, the patient may be more comfortable with the knees drawn up. Place a coat, a pillow, or some other bulky cloth material under the knees to help maintain this position. **Do not attempt to push the intestines back in or to manipulate them in any way.** Do not try to clean dirty intestines; this will be done thoroughly at the hospital.

2. If the intestine is not exposed, cover the wound with a dry, sterile dressing. If the intestine is exposed (fig. 13-10), apply a sterile bandage moistened with sterile water. If no sterile water is available, clean sea water or any water that is fit to drink may be used to moisten the bandage. The bandage should be large enough to cover the wound and the surrounding area.

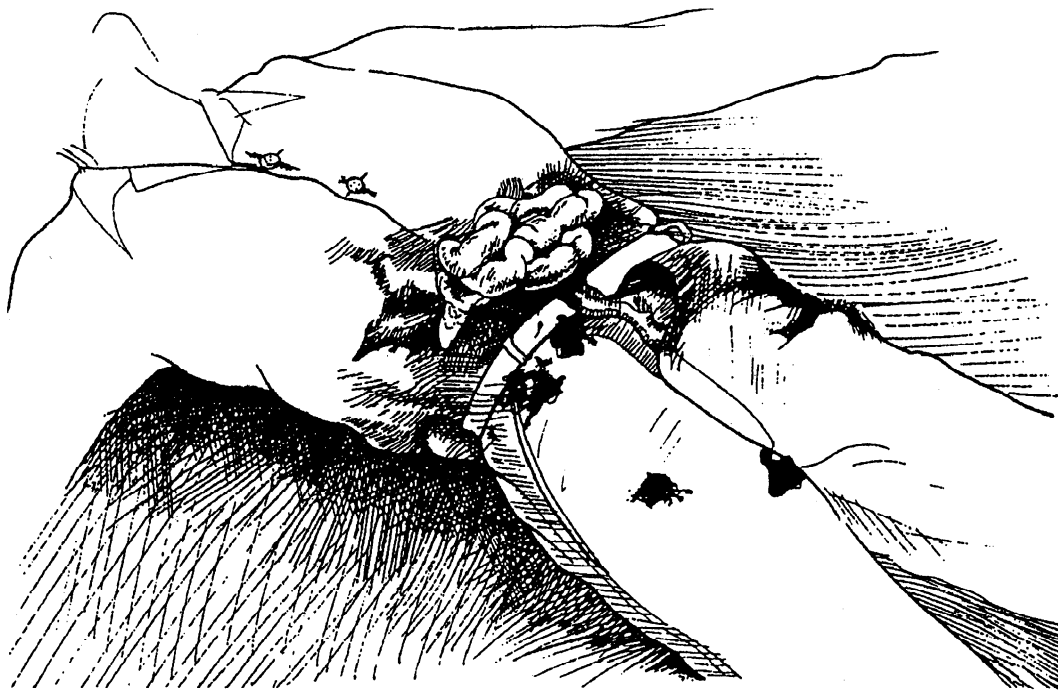


Figure 13-10.—Exposed intestine.

Fasten the bandage firmly so that the dressing will not slip around, but do not apply more pressure than is necessary to hold the bandage in position. Ideally, the dressing should be folded under and then over the intestines (envelope style).

3. Apply an occlusive material such as aluminum foil or plastic wrap over sterile dressing and secure in place with tape or other material. This will help keep the sterile dressing moist.

4. Treat for shock. The casualty must be taken to a medical facility at the earliest opportunity. **Do not give the patient anything to eat or drink.** If he/she complains of great thirst, moisten the lips with a small amount of water, but **do not** allow the patient to swallow.

Summary of Wounds

Although it is not always necessary to know what agent or object caused a wound, it is often helpful because it may give you some idea of the probable size of the wound, its general nature, the extent to which it is likely to be contaminated with foreign matter, and what special dangers must be guarded against.

The emergency treatment for all wounds consists mainly of stopping the flow of blood, treating for shock, and preventing infection.

For a casualty with multiple wounds, first treat the wound that appears to be most life-threatening. Be sure to check all possible points of the body for injury.

Your first concern is to stop the bleeding, preferably by direct pressure, elevation, or the use of pressure points. A tourniquet should be used only if the other methods do not control the bleeding.

Do not spend undue time trying to clean a dirty wound. This will be done by medical personnel. But, apply a dressing to help prevent additional contamination of the wound.

If a foreign object is near the surface and exposed, you may remove it. But if the injury is caused by a knife or other object that is still embedded, **do not remove the object.** It may cause massive bleeding. Simply apply dressings around the object.

SECONDARY EXAMINATION

As already explained, the primary examination was to assess the site and the life threatening injuries to the casualties. The secondary examination is much more thorough and extensive. It includes a full-body assessment.

The secondary examination, a systematic full body survey from head to toe, is usually conducted in a relatively safe area. Be careful not to move the casualty unnecessarily until you are satisfied that there are no major injuries (e.g., neck or spinal injuries) not

detected in the primary examination. Use common sense: do not remove wound dressings, pull off clothing attached to the wound, or probe the wound. During the examination:

- **Look** for discolorations, wounds, unusual chest movements, deformities, penetrations, vomit, etc.
- **Listen** for changes in breathing patterns, unusual breathing sounds, and grating noises made by the ends of broken bones.
- **Feel** for deformities, wounds, swelling, abnormal hardness or softness, tenderness, spasms, and skin temperature.
- **Smell** for any unusual odors coming from the casualty's body, breath, or clothing.

Special Emergency Care Procedures

Special emergency care procedures common to the emergency treatment of practically all casualties include:

- Administering morphine
- Intravenous infusion of fluids
- Transporting an IV casualty

ADMINISTERING MORPHINE.—Morphine is the most effective of all available pain-relieving drugs. When administered properly, it can relieve severe pain and prevent shock.

As a dental assistant, you will not ordinarily administer morphine. Experienced medical personnel make the decision to administer this drug. But situations do arise, such as mass casualties, when you may be issued syrettes containing 1/4 grain of morphine (fig. 13-11).

You may give one syrette of morphine to a casualty suffering severe pain. You may give a second syrette only if a casualty's severe pain persists **and at least 4 hours have passed since you administered the first syrette**. After this, **do not** administer any more morphine unless told to do so by a medical or dental officer.

MORPHINE CANNOT BE GIVEN TO ALL CASUALTIES WHO SUFFER SEVERE PAIN. Administer morphine **only** if the pain is very severe and **only** if there is:

- No head, neck, or spine injury
- No chest injury

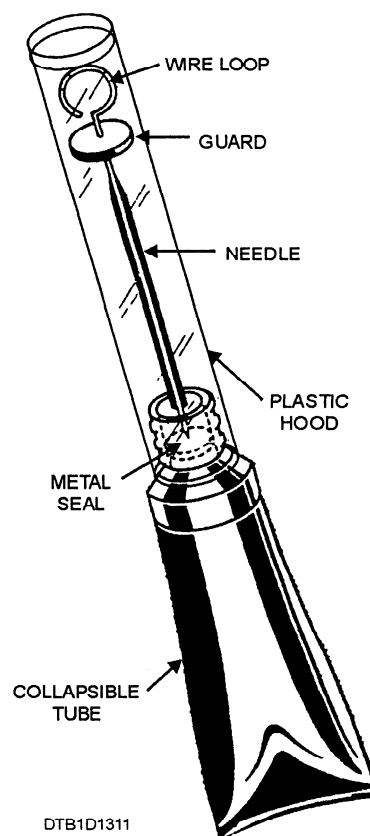


Figure 13-11.—Morphine syrette.

- No airway obstruction or impairment
- No wound of the throat, nasal passages, mouth, or jaws from which blood might flow to obstruct the airway
- No evidence of severe or deepening shock
- No loss of consciousness

If you administer morphine in a mass casualty situation, you should:

1. Select an injection site. The best site is the muscle on the back of the upper arm. If both arms are injured, you may use a thigh or buttock as an injection site.

WARNING

If a tourniquet has been applied to the arm or the thigh, you must inject the morphine between the tourniquet and the main part of the body, if no other extremity is available.

2. Disinfect the injection site if you have the time and the materials. Swab the injection site with alcohol or any skin antiseptic. If no antiseptic is available, wash the injection site with soap and water, or with plain tap water.

3. Remove the plastic hood from the syrette.

4. Grasp the wire loop at the end of the needle and push down on the loop until it is stopped by the guard. This will pierce the metal seal on the collapsible tube.

5. Pull on the wire loop and withdraw the wire completely from the needle. Throw the wire away. **Do not touch the needle.**

6. Thrust the full length of the needle straight through the skin at the injection site.

7. Inject the morphine by slowly squeezing the collapsible tube. Start squeezing at the end of the tube and work your way down toward the needle. Once all the morphine has been injected, withdraw the needle and massage the injection site for a few minutes to help circulate the morphine.

8. Record your treatment. Medical personnel who later provide treatment for the casualty must know when the morphine was administered. Record the treatment on the U.S. Field Medical Card (discussed later), and write the letter "M" and the time of the injection (e.g., M 0830), on the casualty's forehead. Use a skin pencil, or another semipermanent marking for this purpose. You should also attach the empty syrette to the casualty's shirt collar or to some other conspicuous part of the clothing.

INTRAVENOUS INFUSION OF FLUIDS.—

Parenteral therapy is the nonoral (not by mouth) administration of fluids (e.g., intravenous infusion of fluids). This therapy may be required when a casualty loses a large quantity of body fluids as a result of injury and shock. To halt and reverse shock, lost fluids must be replaced. If a casualty cannot take fluids by mouth, or is unable to take enough by mouth, a medical or dental officer may administer fluids by other means. Ordinarily, you will not be involved with the intravenous administration of fluids, but in a mass casualty situation, you may be required to assemble, insert, and maintain intravenous therapy equipment either under the supervision of a medical or dental officer, or on your own.

Intravenous therapy, commonly called an IV, refers to the administration of fluids, drugs, or blood directly into the circulatory system by way of a vein. When whole blood is administered, the technique is called *transfusion*. When sterile fluids (blood volume expanders) are administered, the technique is called *infusion*.

Intravenous infusion is used in the field for three major reasons:

- To add fluid volume to the circulatory system when there is an imbalance or depletion of normal body fluids, as in hemorrhage or burns.

- To establish and maintain life support for a casualty whose condition is questionable, and it is felt that the person might deteriorate.
- To provide an access for the administration of medications.

There are basically four types of fluids used for infusion in the field:

- D5W, 5 percent dextrose and sterile water, given in cases where the IV is used to establish a lifeline or a medication route.
- N.S., or normal saline, which is 0.09 percent sodium chloride in sterile water, and used for irrigation of wounds.
- Lactated Ringers, a solution of electrolytes isotonic (having equal pressure as blood, so that it will not destroy red blood cells when injected into the blood stream) is used for trauma cases, burns, and hemorrhagic shock.
- Dextran, a blood plasma substitute containing large molecules of glucose, used in serious hemorrhage cases.

The equipment used is in sterile disposable sets, as shown in figure 13-12. The equipment set contains:

1. The solution to be infused.
2. The IV itself, consisting of the piercing device cover, piercing device, airway valve, drip chamber, roller clamp, tubing, needle, and needle cover.
3. Some sets may contain auxiliary equipment such as an arm board, antiseptic solution, tape to secure the IV tubing, a tourniquet, and gauze pads to cover the insertion site.

Preparing the Solution.-The medical officer will choose the solution and needle for the infusion procedure. The solution comes in a plastic bag that must be connected to the sterile, disposable infusion set. Connect the bag to the infusion set using the following procedures:

1. Open the infusion set, close the roller clamp on the tubing, and put the infusion set aside.
2. Remove the solution bag from the wrapper. Ensure that the expiration date has not passed. Check the solution by holding the bag up to the light. The solution should be clear. The solution **cannot** be used if it is cloudy or if it contains any sediment or mold. Squeeze the bag and check for small leaks. If there is

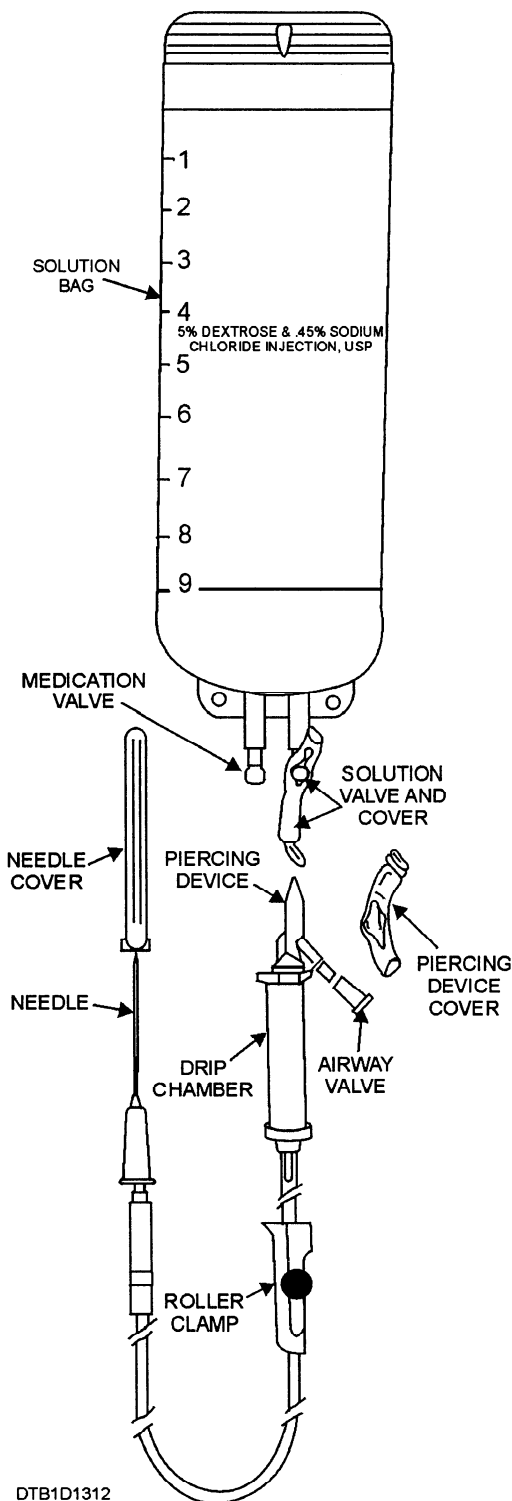


Figure 13-12.—Plastic solution bag and sterile disposable infusion set.

anything wrong with the solution or the bag, inform the medical officer. Get a new bag and discard the old one.

3. Hold the medication valve under your thumb as shown in figure 13-13. Remove the cover from the solution valve. Make sure not to touch the end of the solution valve, as this will contaminate it. Continue to

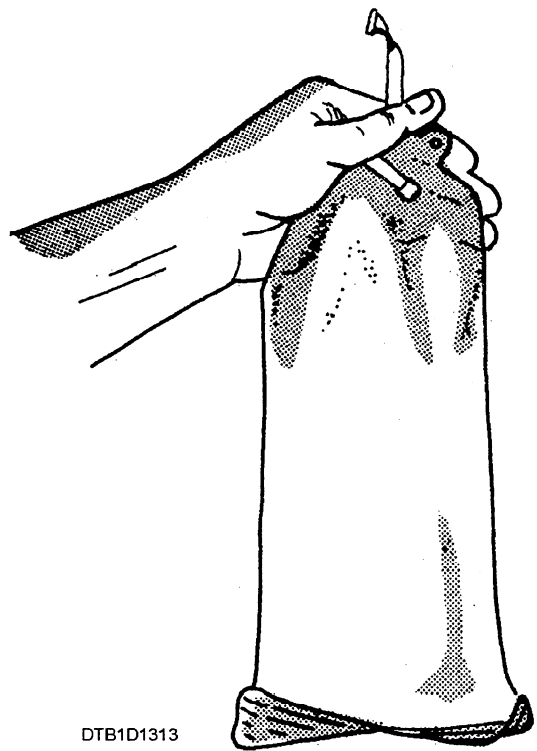


Figure 13-13.—Holding the solution bag.

hold the medication valve under your thumb, so that the medication valve does not come into contact with the solution valve.

4. Remove the cover from the piercing device. Insert the piercing device into the solution valve on the bag.

5. Invert the solution bag and hang it on a rack at least 30 inches above the casualty's head.

6. Remove the airway valve at the top of the drip chamber on the infusion set.

7. Press and release the sides of the drip chamber. This will pump the solution into the chamber. Continue until the chamber is one-half full.

8. Grasp the end of the needle cover and uncover the needle.

CAUTION

Do not touch the needle or the bottom lip of the needle cover.

9. Hold the needle so the point is down, and then open the roller clamp. Allow the air solution to flow through the tubing until the tubing is filled and all air bubbles are expelled.

10. Close the roller clamp, and then put the cover back on the needle.

Inserting An IV.—To infuse an IV solution, perform the following procedures:

1. Choose the insertion site, usually one of the veins in the forearm. Apply a constricting band to the casualty's upper arm. The constricting band should be just tight enough to stop blood flow in the vein. It **should not** be so tight that it cuts off blood flowing in the arteries.

2. You may have to immobilize the casualty's arm. This is done by placing an armboard under the arm and securing the board with bandages above the tourniquet and at the wrist.

3. Locate the vein. This can often be done visually because the tourniquet helps the vein to stand out. Or you can have the casualty clench and unclench the fist several times. As the casualty does this, examine the insertion site with your fingers to detect the vein by touch. It may also help to slap the skin over the vein with your fingers.

4. After locating the vein, thoroughly clean the insertion site with an alcohol sponge.

5. The next step is venipuncture, the piercing of the vein with the needle. Usually a medical officer will do this. However, if you are in a mass casualty situation and if you have had training in venipuncture, the medical officer may direct you to insert the needle. To insert the needle:

a. Remove the protective cover from the needle. Do not touch the needle.

b. Hold the needle so it points toward the casualty's upper arm. One side of the needle is beveled, or slanted. Usually, the needle is inserted in the vein with the beveled side up. The only exception to this would be if the casualty's veins are very small.

c. Hold the needle firmly. The tip of the needle should be directly over the vein. The needle should be at about a 10- to 20-degree angle with the skin.

d. Place the thumb of your free hand about 2 inches beyond the insertion site and stretch the skin tight.

e. Pierce the skin with the needle, and then immediately lower the needle so it is almost parallel with the skin. Exerting slight upward pressure to the needle, slowly and steadily push it forward through the top wall of the vein. Still exerting slight upward pressure, very slowly and very carefully advance the needle along the top wall of the vein for a distance of about 1 inch. The upward pressure will cause the vein to

rise slightly. Do not exert downward pressure, as the needle could puncture the bottom wall of the vein.

6. Secure the needle in place with one or two strips of adhesive tape. Make a loop in the tubing and then secure the tubing in place with adhesive tape.

7. Adjust the roller clamp on the tubing for the proper flow rate, as directed by the medical officer. You can determine the flow rate by observing the drip chamber for 1 minute. The usual flow rate is 40 to 60 drops per minute.

8. While the fluid is being infused, the officer may have you monitor the casualty. Try to keep the casualty still, so the patient doesn't dislodge the needle. Observe the drip chamber on the infusion set to see that the fluid flows properly. If there is any irregularity in the flow rate or if the fluid stops flowing, inform the officer at once. When the solution bag is almost empty, inform the medical officer. Be on the lookout for any of the following reactions and report them to the officer immediately:

- Casualty shivers or shows signs of being chilly.
- Those hopelessly wounded or dead on arrival.
- Casualty's pulse rate increases.
- Casualty's color changes.
- Signs of swelling around the needle insertion site.

9. When the casualty has received enough fluid, the officer may direct you to remove the infusion set. To do this, close the roller clamp on the tubing. Remove the tape used to hold the needle and tubing in place. Place an alcohol sponge over the needle insertion site, and withdraw the needle. After withdrawing the needle, press the alcohol sponge over the insertion site until bleeding stops.

10. Discard the solution bag and the infusion set. They cannot be reused.

TRANSPORTING AN IV CASUALTY.—

When the casualty is stabilized and ready to be moved, elevate the fluid container well above the level of the casualty's heart. If you are using fluid in a bag, place the bag under the patient until it can be hung up. During transporting, continue to monitor the IV to ensure that it does not become dislodged.

When moving over rough terrain or heavy underbrush, you can stop the IV drip for 4 or 5 minutes,

if necessary. Strap the container to the casualty so that the needle does not become dislodged.

PREPARING MEDICAL TAGS.—In a combat or mass situation, it is important for you to document

the treatment provided in the field or at the site so that medical personnel providing definitive treatment will know what emergency measures were taken and the circumstances involved. To aid in this documentation, use the U.S. Field Medical Card.

1. NAME (Last-First-Middle Initial)/NOM, PRENOMS FROST, JACK R		2. SERVICE NUMBER/NUMERO MATRICULE 333-33-3333		3. GRADE/GRADE LT 03		4. NATION/NATION (e.g. Etats Unis) U.S	
5. FORCE/ARMEE USN		6. BRANCH AND TRADE/ARME (e.g. Infanterie) AIR		7. UNIT/UNITE VF-101		8. SERVICE (Yrs)/DUREE DES SERVICES (e.g. 2 6/12) 5	
9. AGE/AGE 28		10. RACE/RACE BLK		11. RELIGION/RELIGION METH		12. FACILITY WHERE TAGGED/LIEU D'ETABLISSEMENT DE LA FICHE FLEET HOSPITAL 4	
13. DATE AND HOUR TAGGED/DATE ET HEURE D'ETABLISSEMENT DE LA FICHE 11 Aug 98 1345		14. DIAGNOSIS (Including cause)/DIAGNOSTIC (Cause comprise) FX (L) FEMUR					
15. LINE OF DUTY/EN RELATION AVEC LE SERVICE YES		16. NATURE OF CASUALTY OR ILLNESS NATURE DE LA BLESSURE OU MALADIE DISABILITY/INCAPACITE ENEMY ACTION/ DU FAIT DE L'ENNEMI 16. INJURY/BLESSURE <input checked="" type="checkbox"/> YES/OUI <input type="checkbox"/> NO/NON 17. SICK/MALADIE <input type="checkbox"/> YES/OUI <input type="checkbox"/> NO/NON 18. DATE & HOUR INJURED/DATE ET HEURE DE LA BLESSURE 11 Aug 98 0610					
19. WHAT WAS HE DOING WHEN INJURED/QUE FAISAIT-IL LORSQU'IL FUT BLESSE AIRCRAFT SHOT DOWN/PILOT EJECTED		20. TREATMENT GIVEN (For antibiotics specify which and give dose, hour and date)/ TRAITEMENT EFFECTUE (Si des antibiotiques ont été donnés, précisez leur nature, la dose, l'heure et la date) FX-SPLINTED, DRESSING AT FX SITE					
21. TOURNIQUET (Yes or No; Time & date applied)/ MISE EN PLACE D'UN GARROT (Oui ou Non; heure et date) NO		22. TREATMENT/TRAITEMENT EFFECTUE a. DOSE/DOSE b. HOUR AND DATE/HEURE-DATE 22. MORPHINE-1st/MORPHINE-1ere 1/4 gr 0630 11 AUG 98 23. MORPHINE-2nd/MORPHINE-2eme 24. MORPHINE-3rd/MORPHINE-3eme 25. TETANUS TOXOID/VACCIN ANTITETANIQUE 26. A. T. SERUM/SERUM ANTITETANIQUE					
27. DISPOSITION-DISPOSAL/DESTINATION DONNEE AU BLESSE MEDAVAC TO N.H. ROTA		28. HOUR AND DATE/HEURE ET DATE 1500 11 AUG 98		29. MEDICAL OFFICER (Signature & Grade)/SIGNATURE ET GRADE DU MEDECIN John R. Doe COR/MC/USN			

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S/N 0102-LF-013-5500

U. S. FIELD MEDICAL CARD/FICHE MEDICALE DE L'AVANT ETATS-UNIS

Figure 13-14A.—U.S. Field Medical Card (front).

a. ABSOLUTION/CONFESSION		b. HOLY COMMUNION/SAINTE COMMUNION		c. EXTREME UNCTION/EXTREME ONCTION	
30. d. OTHER MINISTRATIONS/AUTRES MINISTERES		e. CHAPLAIN (Signature)/SIGNATURE DE L'AUMONIER			
31. DIET/REGIME ALIMENTAIRE <input type="checkbox"/> REGULAR/NORMAL <input type="checkbox"/> LIQUID/LIQUIDE <input type="checkbox"/> NOTHING BY MOUTH/RIEN PAR VOIE ORALE					
32. REMARKS/REMARQUES ORTHOPEDIC CLINIC, NAVAL HOSPITAL ROTA WILL TREAT PATRNT.					

☆ U.S. GOVERNMENT PRINTING OFFICE: 1984-707-466

Figure 13-14B.—U.S. Field Medical Card (back).

This card is two-sided (figs. 13-14A and 13-14B) and contains blocks for recording the casualty's personal data, the initial diagnosis, nature of the casualty, date and time of the injury, emergency medical treatment rendered, casualty disposition, and the signature of the aid person rendering the initial treatment. Make every effort to complete the card as accurately as possible. This information will be extremely helpful to the medical staff after the casualty has been transported for further medical treatment.

Heat Injuries

Burns, heat cramps, heat exhaustion, and heat stroke are the injuries most commonly caused by exposure to extreme heat. Although burns caused by contact with acids, alkalies, and other chemicals are not true heat burns, they are discussed here.

BURNS.—To provide the proper emergency treatment for a burn, you must determine the type of burn, the depth of the burn, and how much of the casualty's body is burned.

Three types of burns are covered here: thermal, chemical, and electrical. A thermal burn is caused by exposure to heat from sources such as fire, hot objects, hot gases, hot liquids, or explosions. A chemical burn occurs when a person comes in contact with a caustic chemical. An electrical burn occurs when a person

comes in contact with a live wire or is struck by lightning. It is important to distinguish between these types of burns because the treatment is different for each.

You can visually examine a burn to determine how deep it is. Burns are classified according to their depth as first degree, second degree, and third degree as shown in figure 13-15.

First-degree burns are the mildest, producing a redness of the skin's outer layer, increased warmth, tenderness, and mild pain.

Second-degree burns extend through the skin's outer layer to involve the deeper layers. The skin reddens and blisters, and the casualty experiences severe pain.

Third-degree burns destroy the skin and may destroy underlying tissue and bone. The casualty may not experience severe pain, because all the nerve endings in the burn area may have been destroyed. The color of the third-degree burn may vary from white and lifeless to black.

To determine how much of a casualty's body is burned, use the rules of nine (fig. 13-16). According to this method, each of the following areas of the body represent 9 percent of the body's surface, with the genital area representing 1 percent.

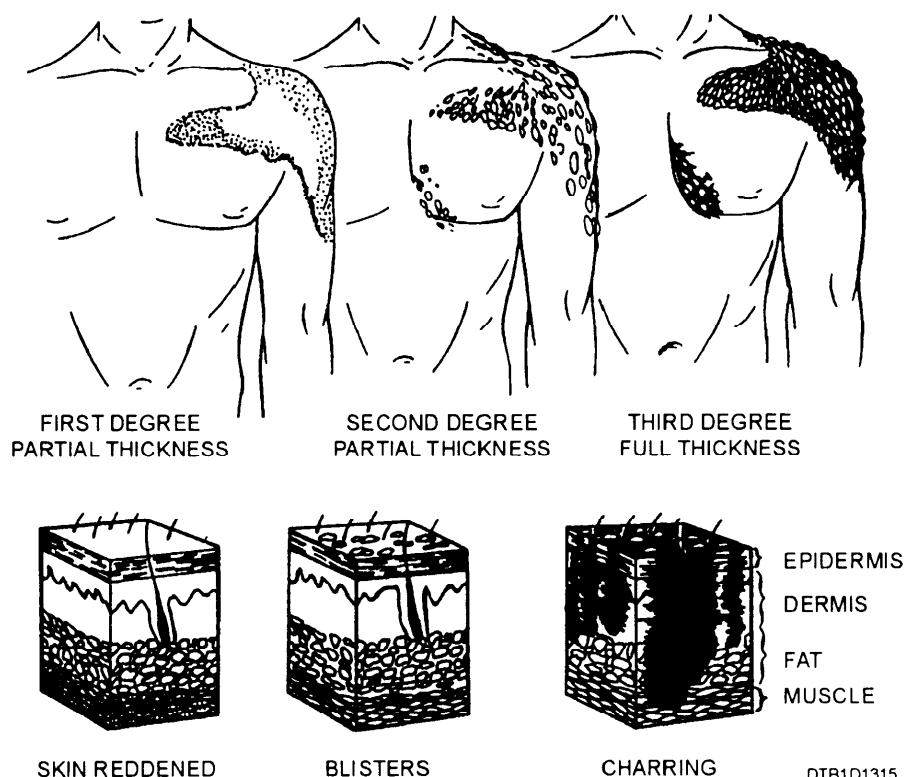


Figure 13-15.—First, second, and third degree burns.

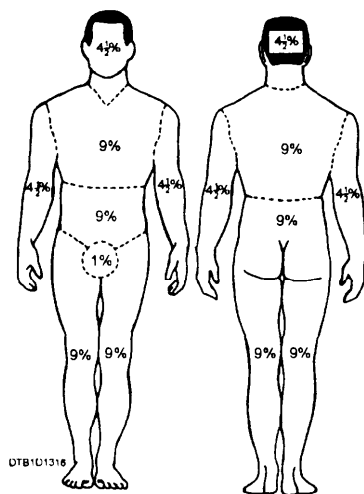


Figure 13-16.—Rules of nine.

- The head and neck
- The front of each leg
- The back of each leg
- The chest
- The abdomen
- The upper back
- The lower back and buttocks

As a general rule, all third-degree burns should be regarded as serious, as should first-degree and second-degree burns that cover more than 15 percent of a casualty's body. All facial burns should also be regarded as serious.

A casualty with a serious burn will usually be experiencing shock, and the patient's life may be in danger. The casualty must receive emergency treatment immediately. You should then get medical assistance or transport the casualty to an aid station as soon as possible.

Thermal Burns.—If a casualty is suffering from a serious thermal burn, you should take the following steps:

1. Ensure there is an open airway.
2. Treat to prevent infection.
3. Treat for shock.

Ensure there is an open airway. Hot gases or smoke may have caused the casualty's airway to swell shut. Tilt the casualty's head to the chin-up position. If the casualty is not breathing, apply artificial ventilation. If the casualty is breathing but has facial burns, place the casualty in a sitting position if this makes breathing easier.

TREAT TO PREVENT INFECTION.—Cover the entire burned area with a sterile dressing. **Do not put ointments, antiseptics, or other medications on a burn.** These will interfere with later treatment. To prevent infection of the burn, you must observe the following precautions:

- Never allow any unsterile objects or material to come into contact with the burn. (However, in an emergency situation when no sterile dressing is available, you may cover the burn with a clean sheet or an unused plastic bag.)
- Never use rough textured materials like blankets to cover the burn.
- Never attempt to break blisters.
- Never attempt to remove shreds of tissue or charred clothing from the burn.

For thermal burns of the eye, make sure that the casualty does not rub the eyes. Cover each eye with a small, moist, thick compress. Fasten the compress in place with a bandage. Treat the casualty for shock.

To treat for shock, maintain the casualty's body heat, but do not allow the casualty to become overheated. If the casualty is in severe pain, you may administer morphine, but only under the mass casualty conditions discussed earlier. A seriously burned casualty has an overwhelming need for liquids. If the casualty is conscious, has no internal injuries, and is not vomiting, prepare a weak solution of salt (1 teaspoon) and baking soda (1/2 teaspoon) in a quart of warm water. Allow the casualty to sip slowly.

Chemical Burns.—Corrosive chemicals that come in contact with body tissues may cause chemical burns. To treat a casualty with a serious chemical burn, take the following steps:

1. Immediately flush the burned area with large amounts of water. Pour water over the area; use a hose or shower if one is available. Do not apply water too forcefully, because this could further damage the burned tissue. While the area is being flushed, remove the casualty's clothing, including the shoes and socks. Keep flushing the area until all traces of the chemical have been removed.
2. Gently pat the burned area with sterile gauze. Do not rub the area with the gauze. Be careful not to break the skin or open any blisters.
3. Prevent infection by covering the entire burned area with a sterile dressing, just as you would for a thermal burn.

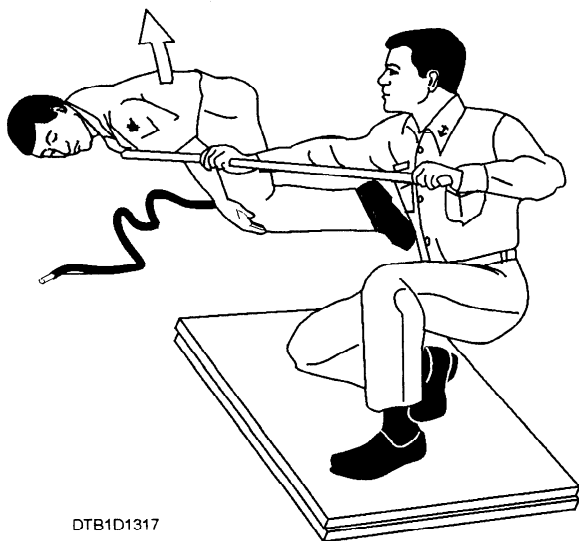
4. Treat for shock, just as you would for a thermal burn. For chemical burns of the eye, make sure that the casualty does not rub the eyes. Immediately flush the eyes with large quantities of fresh, clean water. Have the casualty lie down with the head turned slightly to one side. To flush the eye, pour water into the **inside** corner of the eye and let it flow across the eyeball to the **outside** corner. The water must not be poured with any greater force than is necessary to sustain the flow across the eyeball. **Because of the intense pain, the casualty may be unable to open the eyes. If this occurs, you must hold the eyelids open so that the water can flow across the eyeball.** After irrigating the eyes, loosely cover them with a sterile dressing. Treat the casualty for shock.

Electrical Burns.—Electrical burns are more serious than they first appear. The entrance wound may be small, but as electricity penetrates the skin, it burns a large area below the surface. Usually there are two external burn areas: one where the current enters the body and another where it leaves.

Before administering emergency treatment, remove the casualty from the electrical source. If power equipment is involved, shut it off or disconnect it immediately.

When rescuing a casualty who is in direct contact with a power line, stand on a well-insulated object, and use a dry rope or a wooden pole to either push or pull the wire away from the casualty, or the casualty away from the wire (fig. 13-17). Do not touch the casualty until this is done or you, too, will become a casualty.

Electrical burns are often accompanied by respiratory failure and cardiac arrest, which are of more immediate danger to the casualty than the burn



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Figure 13-17.—Pushing a casualty away from a power line.

itself. Start cardiopulmonary resuscitation (CPR) (explained in *Dental Technician*, Volume 2, NAVEDTRA 12573, chapter 9) immediately and continue until the casualty regains a normal heartbeat and breathing pattern. Finally, lightly cover the site of the burn with a preferably dry sterile dressing, treat for shock, and transport the casualty to a medical facility.

HEAT EXPOSURE INJURIES.—Excessive heat affects the body in a variety of ways. When a person exercises in a hot environment, heat builds up inside the body. The body automatically reacts to get rid of this heat through the sweating mechanism. If the body loses large amounts of water and salt from sweating, heat cramps and heat exhaustion are likely to follow. When the body becomes overheated and cannot eliminate the excessive heat, heat stroke will result.

Heat Cramps.—Heat cramps usually affect people who work in hot environments or who engage in strenuous exercise without acclimatization and proper training. Excessive sweating may result in painful heat cramps in the muscles of the abdomen, legs, and arms. Heat cramps may also result from drinking ice water or other cold drinks either too quickly or in too large a quantity after exercise. Muscle cramps are often an early sign of approaching heat exhaustion. Muscle spasms or heat cramps usually last only a few minutes and disappear spontaneously.

To provide emergency treatment for heat cramps, move the casualty to a cool place. Heat cramps are caused by loss of salt and water, so give the casualty plenty of water to drink, adding about 1 teaspoon of salt to a quart of water. Apply manual pressure to the cramped muscle, or gently massage it to relieve the spasm. If the heat cramps do not pass, or if they become more severe, other symptoms may follow. The casualty should be treated as a heat exhaustion casualty and then transferred to a medical facility for further treatment.

Heat Exhaustion.—Heat exhaustion is the most common condition resulting from exposure to hot environments. Heat exhaustion is not easily diagnosed because it can be a combination of several factors. Because of these factors, the signs and symptoms may vary. As a general rule, heat exhaustion will involve a serious disturbance of blood flow to the brain, heart, and lungs. This may cause the casualty to experience weakness, fatigue, headache, loss of appetite, and nausea. The person may faint, but will probably regain consciousness when the head is lowered to improve the blood supply to the brain. The casualty will appear

ashen gray, the skin will be cold, moist, clammy, and the pupils of the eyes may be dilated (enlarged). Vital signs are usually normal but the casualty may have a weak pulse, together with rapid, shallow breathing. The body temperature may be below normal.

Treat the casualty as if the patient were in shock. Move the person to a cool or air-conditioned area. Loosen the clothing; apply cool wet cloths to the head, neck, groin, and ankles; and fan the casualty. Do not allow the person to become chilled. If they become chilled, cover with a light blanket and move to a warmer area. If the casualty is conscious, give a solution of 1 teaspoon of salt mixed in a quart of cool water. If the person vomits, do not give any more fluids. Transport the casualty to a medical facility as soon as possible.

Heat Stroke.—Sunstroke is more accurately called heat stroke because a person need not be exposed to the sun for the condition to develop. Heat stroke is a less common but far more serious condition than heat exhaustion because it carries a 20 percent mortality rate. The most important feature of heat stroke is the extremely high body temperature (105°F or 41°C) or higher. In heat stroke, the casualty's sweating mechanism breaks down and cannot eliminate excess body heat. If the body temperature rises too high, the brain, kidneys, and liver may be permanently damaged.

Sometimes the casualty may have preliminary symptoms such as headache, nausea, dizziness, or weakness. Breathing will be deep and rapid at first; later it will be shallow and almost absent. Usually the casualty will be flushed, very dry, and very hot. Pupils will be constricted (pinpointed) and the pulse will be fast and strong. Compare heat stroke symptoms with those of heat exhaustion. (See figure 13-18.)

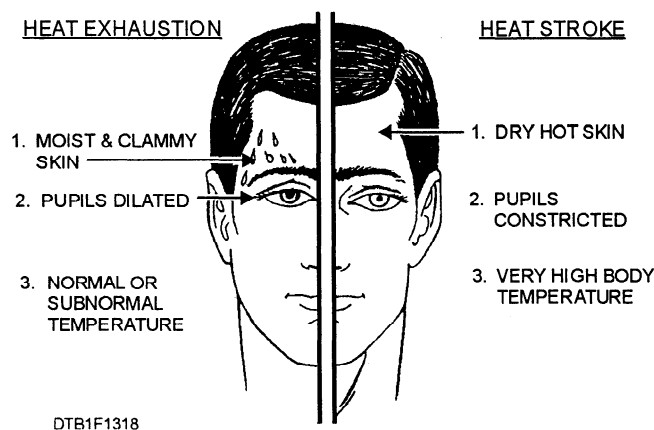


Figure 13-18.—Symptoms of heat exhaustion and heat stroke.

When providing emergency treatment for heat stroke, keep in mind that if the casualty remains overheated, the more likely he/she will suffer irreversible body damage or death. Your main objective is to get the body temperature down as quickly as possible.

Move the casualty to the coolest possible place, and remove as much clothing as possible. Body heat can be reduced quickly by immersing the casualty in a cold water bath. If that is not possible, give the casualty a sponge bath by applying wet, cold towels to the entire body. Or you can expose him/her to a fan or air conditioner. If cold packs are available, place them under the arms, around the neck, at the ankles, and in the groin. If the casualty is conscious, give him/her cool water to drink. Do not give any hot drinks or stimulants.

Because of the seriousness of heat stroke, it is important to get the casualty to a medical facility as soon as possible. Continue the cooling measures during transportation.

Cold Weather Injuries

When the body is subjected to severely cold temperatures, the blood vessels constrict and body heat is gradually lost. As the body temperature drops, tissues are easily damaged or destroyed.

All cold weather injuries are similar, varying only in the degree of injury to tissues. The extent of injury depends on such factors as wind speed, temperature, type and duration of exposure, and humidity. Freezing of tissue accelerates with wind, humidity, or a combination of the two.

Fatigue, smoking, drugs, alcoholic beverages, emotional stress, dehydration, and the presence of other injuries intensify the harmful effects of the cold. In cold weather, wounds bleed easily because the low temperatures keep the blood from clotting; increased bleeding increases the likelihood of shock.

GENERAL COOLING (HYPOTHERMIA).—General cooling of the whole body is caused by continued exposure to low or rapidly falling temperatures, cold moisture, snow, or ice. Even though well protected by clothing, a person exposed to low temperatures for an extended period may suffer ill effects because cold temperatures affect the body systems slowly, almost without notice. As the body cools, the casualty goes through several stages of progressive discomfort and disability. The first symptom is shivering, the body's attempt to generate heat by repeated contractions of surface muscles. This

is followed by a feeling of listlessness, indifference, and drowsiness. Unconsciousness can follow quickly. Shock becomes evident as the casualty's eyes assume a glassy stare, respiration becomes slow and shallow, and the pulse is weak or absent. As body temperature drops even lower, peripheral circulation decreases, and the extremities become susceptible to freezing. Finally, death results as the core temperature of the body approaches 80°F.

To treat hypothermia, take the following steps:

1. Carefully observe respiratory effort and heartbeat; you may have to give CPR during the warming process.

2. Rewarm the casualty as soon as possible. Severe bleeding must be controlled and fractures splinted over clothing before the casualty is moved.

3. Replace wet or frozen clothing and remove anything that constricts the casualty's arms, legs, or fingers, interfering with blood circulation.

4. If the casualty is inside a warm place and is conscious, the most effective method of warming is immersion in a tub of warm water (100°F to 105°F or 38°C to 41°C). The water should be warm to the elbow and never hot. Observe closely for signs of respiratory failure and cardiac arrest (rewarming shock).

5. If a tub is not available, apply external heat to both sides of the casualty. Natural body heat (skin to skin) from two rescuers is the best method. This is called "buddy warming." If this is not practical, use hot water bottles or an electric rewarming blanket, but do not place them next to bare skin. Be careful to monitor the temperature of the artificial heat source; the casualty is very susceptible to burn injury. Because casualties are unable to generate adequate body heat, placing them under a blanket or in a sleeping bag is not sufficient treatment.

6. If the casualty is conscious, give warm liquids to drink. Never give alcoholic beverages, or allow the casualty to smoke.

7. Dry the casualty thoroughly if water is used for rewarming.

8. As soon as possible, transfer the casualty to a definitive care facility. Be alert for the signs of respiratory and cardiac arrest during transfer, and keep the casualty warm.

CHILBLAINS.—Chilblains are a mild cold injury caused by prolonged and repeated exposure to air temperatures from just above freezing (32°F or

0°C) to as high as 60°F or 16°C. Chilblains are characterized by redness, swelling, tingling, and pain of the skin area. Injuries of this nature require no specific treatment except warming of the affected part, keeping it dry, and preventing further exposure.

IMMERSION FOOT.—Immersion foot, which also may occur in the hands, results from prolonged exposure to wet cold at temperatures ranging from just above freezing to 50°F or 10°C. It is usually in connection with limited motion of the extremities and water-soaked protective clothing.

Signs and symptoms of immersion foot are tingling and numbness of the affected areas; swelling of the legs, feet, or hands; bluish discoloration of the skin; and painful blisters. Gangrene may occur.

To treat immersion foot, follow these steps:

1. Get the casualty off his/her feet as soon as possible.

2. Remove wet shoes, socks, and gloves to improve circulation.

3. Expose the affected area to warm dry air.

4. Keep the casualty warm.

5. Do not rupture blisters or apply salves and ointments.

6. If the skin is not broken or loose, the injured part may be left exposed; however, if you must transport the casualty, cover the injured area with loosely wrapped fluff bandages of sterile gauze.

7. If the skin is broken, place a sterile sheet under the extremity and gently wrap it to protect the sensitive tissue from pressure and additional injury.

8. Transport the casualty as soon as possible to a medical facility as a litter patient.

FROSTBITE.—Frostbite occurs when ice crystals form in the skin or deeper tissues after exposure to a cold temperature, high altitude, and high-wind speed. The exposure time necessary to produce frostbite varies from a few minutes to several hours. The areas commonly affected are the face and extremities.

The symptoms of frostbite are progressive. Casualties generally incur this injury without being acutely aware of it. Initially, the affected skin reddens and there is an uncomfortable coldness. With continued heat loss, there is a numbness of the affected

area because of reduced circulation. As ice crystals form, the frozen extremity appears white, yellow-white, or mottled blue-white, and is cold, hard, and insensitive to touch or pressure.

Frostbite is classified as superficial or deep, depending on the extent of tissue involvement.

Superficial Frostbite.—In superficial frostbite, the surface of the skin will feel hard, but the underlying tissue will be soft, allowing it to move over bony ridges. This is evidence that only the skin and the region just below it are involved.

To treat superficial frostbite, follow these steps:

1. Take the casualty indoors.
2. Rewarm hands by placing them under the armpit, against the abdomen, or between the legs.
3. Rewarm feet by placing them in the armpit or against the abdomen of a buddy.
4. Gradually rewarm the affected area by warm water immersion, skin to skin contact, or hot water bottles.
5. Never rub a frostbite area.

Deep Frostbite.—In deep frostbite, the freezing reaches into the deep tissue layers. There are ice crystals in the entire thickness or the extremity. The skin will not move over bony ridges and feels hard and solid.

The objectives of treatment are to protect the frozen areas from further injury, to rapidly thaw the affected area, and to be prepared to respond to circulatory or respiratory difficulties.

To treat deep frostbite, follow these steps:

1. Carefully assess and treat any other injuries first. Constantly monitor the casualty's pulse and breathing since respiratory and heart problems can develop rapidly. Administer CPR if necessary.
2. Make no attempt to thaw the frostbitten area if there is a possibility of refreezing. It is better to leave the part frozen until the casualty arrives at a medical facility equipped for long term care. Refreezing of a thawed extremity causes severe and disabling damage.
3. Treat all casualties with injuries to feet or legs as litter patients. When this is not possible, the casualty may walk on the frozen limb, since it has been proved that walking will not lessen the chances of successful treatment as long as the limb has not thawed out.

4. When adequate protection from further cold exposure is available, prepare the casualty for rewarming by removing all constricting clothing such as gloves, boots, and socks. Boots and clothing frozen on the body should be thawed by warm water immersion before removal.

5. Rapidly rewarm frozen areas by immersion in water at 100°F to 105°F or 38°C to 41°C. Keep the water warm by adding fresh water, but do not pour it directly on the injured area. Ensure that the frozen area is completely surrounded by water; do not let it rest on the side or bottom of the tub.

6. After rewarming has been completed, pat the area dry with a soft towel. At first, the injured area will feel numb and look mottled blue or purple. Later it will swell, sting, and burn. Blisters may develop and should be protected from breaking. Avoid pressure, rubbing, or constriction of the injured area. Keep the skin dry with sterile dressings and place cotton between the toes and fingers to prevent them from sticking together.

7. Protect the tissue from additional injury and keep it as clean as possible (sterile dressings and linen should be used).

8. Try to improve the general morale and comfort of the casualty by giving hot, stimulating fluids such as tea or coffee. Do not allow the casualty to smoke or use alcoholic beverages while being treated.

9. Transfer the casualty to a medical facility as soon as possible. During transportation, slightly elevate the frostbitten area and keep the casualty and the injured area warm. Do not allow the injured area to be exposed to the cold.

PREPARING THE CASUALTY FOR TRANSPORTING

Before transporting the casualty, ensure that the patient is stable enough to be moved. First, make sure that all hemorrhaging is under control and wounds have been dressed. Second, make sure that all fractures have been splinted and the victim has been treated for shock. If morphine or an IV was administered, see that the casualty has been marked and a U.S. Field Medical Card filled out. The casualty's vital signs should be stable so there will be no problems in route.

TRANSPORTING THE INJURED

It is a basic principle that an injured person must be given essential treatment before being moved. However, it is obviously impossible to treat injuries while the casualty is in a position of immediate danger.

If the casualty is drowning, or life is endangered by fire, steam, electricity, poisonous or explosive gases, live fire in combat situations, or other hazards, rescue the person before giving emergency medical treatment.

The life of an injured person may well depend upon the manner in which he is transported. Rescue operations must be accomplished quickly, but unnecessary haste is both futile and dangerous. After rescue, and after essential emergency treatment has been given, further transportation must be accomplished in a manner that will not aggravate the casualty's injuries.

Next, we will explain the emergency methods of moving injured persons to safety, and the procedures for transporting them after emergency medical treatment has been rendered.

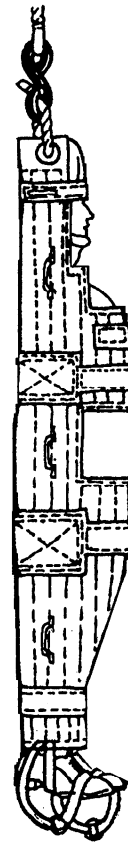
Moving the Casualty to Safety

In an emergency, you may have to hoist, carry, or drag an injured person away from a position of danger. In some instances, you will be able to do this using a Neil Robertson stretcher, an Army litter, or by using an improvised stretcher; in other cases you will have to move the casualty by using the fireman's carry, the tied-hands crawl, the blanket drag, the pack-strap carry, the chair carry, or some type of arm carry. Sometimes, it is necessary to move the patient with all possible speed, without regard to the severity of the injuries.

The military uses a number of standard stretchers. The following discussion will familiarize you with the most common types. Keep in mind these general rules when using a stretcher:

1. Use standard stretchers when available, but be ready to use safe alternatives.
2. When possible, bring the stretcher to the casualty.
3. Always fasten the casualty securely to the stretcher.
4. Always move the casualty **FEET FIRST** so the rear bearer can watch for signs of breathing difficulty.

NEIL ROBERTSON STRETCHER.—The Neil Robertson stretcher (fig. 13-19) is especially designed for removing an injured person from engine room spaces, holes, and other compartments where access hatches or ladders are too small to permit the use of a regular stretcher. This stretcher is extremely valuable aboard ship. It is made of semirigid canvas, which has wooden slats sewn inside the canvas and canvas straps



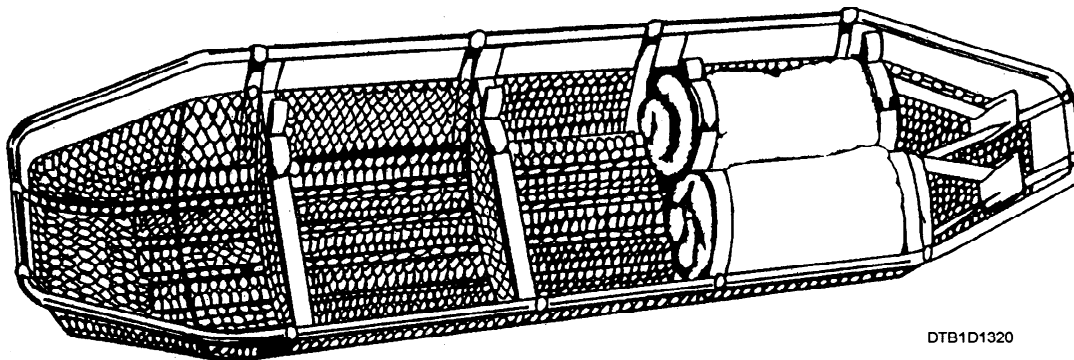
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Figure 13-19.—Neil Robertson stretcher.

to secure the casualty in the stretcher. When firmly wrapped around the casualty in mummy fashion, it gives sufficient support so that the casualty may be lifted vertically. A guideline is tied to the casualty's ankles to keep them from swaying against bulkheads and hatchways while being lifted. If a Neil Robertson stretcher is not available, a piece of heavy canvas wrapped firmly around the casualty will serve somewhat the same purpose.

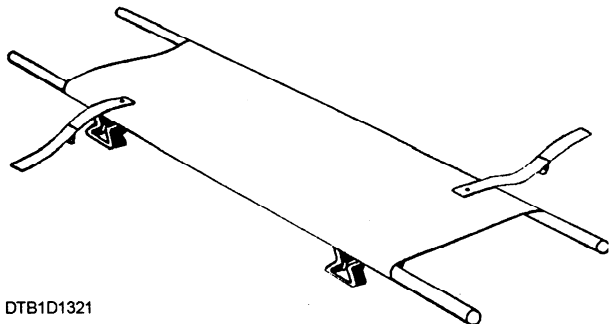
STOKES STRETCHER.—The Stokes stretcher is commonly used for transporting sick or injured people. The Stokes stretcher is essentially a wire basket supported by iron or aluminum rods. It is adaptable to a variety of uses, since the casualty can be held securely in place even if the stretcher is tipped or turned. The Stokes stretcher is particularly valuable for transporting injured persons to and from ships. It can be used with flotation devices to rescue injured survivors from the water. Fifteen-foot handling lines are attached to each end for shipboard use in moving the casualty.

The Stokes stretcher (fig. 13-20) should be padded with three blankets: two of them should be placed lengthwise, so that one will be under each of the casualty's legs, and the third should be folded in half and placed in the upper part of the stretcher to protect



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Figure 13-20.—Stokes stretcher.



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Figure 13-21.—Army litter.

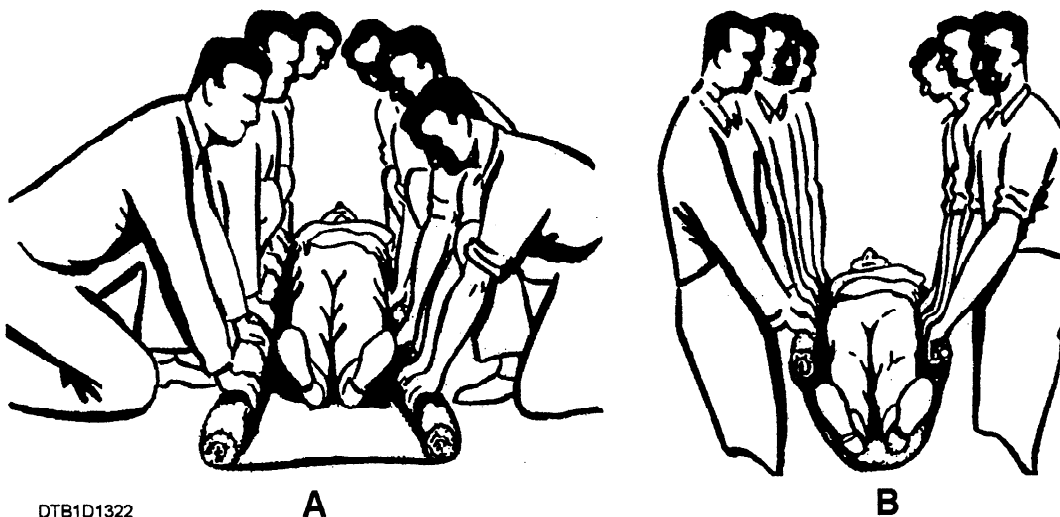
the head and shoulders. The casualty should be lowered gently onto the stretcher and be made as comfortable as possible. The feet must be fastened to the end of the stretcher so they will not slide down. Another blanket (or more, if necessary) should be used to cover the casualty. The casualty must be fastened to the stretcher by means of straps that go over the chest, hips, and knees. Make sure the straps go over the blanket or other covering, to hold it in place.

ARMY LITTER.—The Army litter (fig. 13-21) is a collapsible stretcher made of canvas and supported by wooden or aluminum poles. It is useful for transporting battle casualties in the field. However,

because it is sometimes difficult to fasten the casualty onto the Army litter, its use is limited aboard ship. It is most useful aboard ship in mass casualty situations to hold casualties in one stationary area. The litter is designed so its legs keep the patient off the ground and fit into the restraining tracks of a jeep or field ambulance to hold the litter in place.

IMPROVISED STRETCHER.—Standard stretchers should be used whenever possible to transport a seriously injured person. If no stretcher is available, you may have to improvise. Shutters, doors, boards, and even ladders may be used as stretchers. An improvised stretcher must be well padded and great care must be taken to see that the casualty is fastened securely in place.

Sometimes a blanket may be used as a stretcher (fig. 13-22). The casualty is placed in the middle of the blanket on his/her back. Three or four people kneel on each side and roll the edges of the blanket toward the casualty (see A in fig. 13-22). When the rolled edges are tight and large enough to grab securely, the casualty can be lifted and carried (see B in fig. 13-22).



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Figure 13-22.—Blanket used as an improvised stretcher.

Stretchers may also be improvised by using two long poles (about 7 feet long) and any strong cloth, such as a rug, blanket, sheet, mattress cover, two or three gunny sacks, or two coats.

WARNING

Many improvised stretchers do not give sufficient support to be used in cases where there are fractures or extensive wounds.

EMERGENCY RESCUE LINES.—The steel wire lifeline can be used to haul a casualty to safety. An emergency rescue line can also be made from a strong fiber line. Both are used only in extreme emergencies, when no other means are available to move a casualty.

FIREMAN'S CARRY.—One of the easiest ways to carry an unconscious casualty is by means of the fireman's carry. Figure 13-23 shows the procedures described in the following steps:

1. Turn the casualty so he/she is lying face down (see A in fig. 13-23). Kneel on one knee at the patient's head, facing the casualty. Pass your hands under the patient's armpits; then slide your hands down the back.
2. Raise the casualty to his/her knees (see B in fig. 13-23). Take a better hold across the patient's back.

3. Raise the casualty to a standing position, and stick your right leg between the patient's legs (see C in fig. 13-23). Grasp the patient's right wrist in your left hand and swing the casualty around the back of your neck and down your left shoulder.

4. Stoop quickly and pull the casualty across your shoulders. At the same time, put your right arm between the patient's legs (see D in fig. 13-23).

5. Grasp the patient's right wrist with your right hand and straighten up (see E in fig. 13-23).

TIED-HANDS CRAWL.—The tied-hands crawl, shown in figure 13-24, may be used to drag an unconscious casualty for a short distance; it is particularly useful when you must crawl underneath a low structure.

To carry a casualty by this method, lie the patient flat on his/her back. Cross the patient's wrists and tie them together. Kneel astride the casualty and lift the patient's arms over your head so his/her wrists are at the back of your neck. When you crawl forward, raise your shoulders high enough so that the casualty's head will not bump against the deck or ground.

BLANKET DRAG.—The blanket drag can be used to remove a casualty who is so seriously injured that the person should not be lifted or carried by one

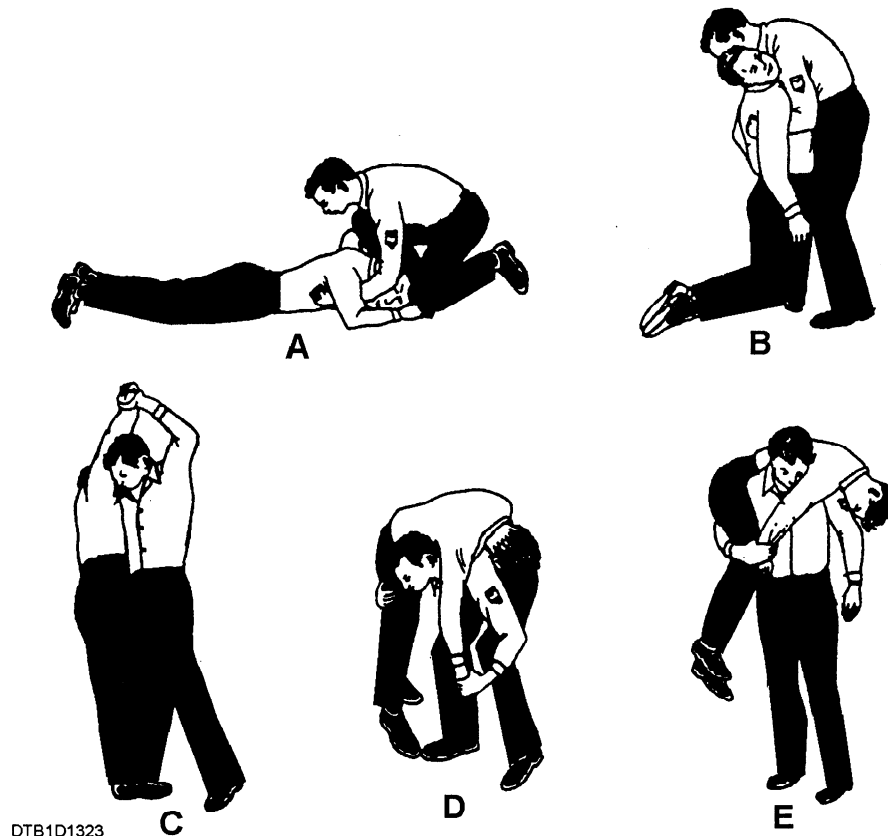
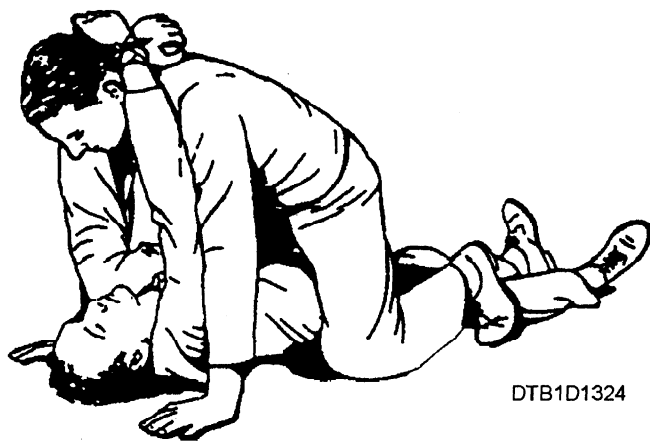


Figure 13-23.—Fireman's carry.



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Figure 13-24.—Tied-hands crawl.

person alone. Place the patient on his or her back on a blanket, and pull the blanket along the floor, deck, or ground. Always pull the casualty head first, with the head and shoulders slightly raised.

CHAIR CARRY.—The chair carry can often be used to move a sick or injured person away from a position of danger. This is a particularly good method to use when you must carry a person up or down stairs or through narrow, winding passageways. It must never be used to move a person who has an injured neck, back, or pelvis.

ARM CARRIES.—Several kinds of arm carries can be used in emergency situations to move a casualty to safety. Figure 13-25 shows how one person can carry the casualty alone. Never try to carry a person this way unless the casualty is considerably smaller



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Figure 13-25.—Arm carry.

than you are because you can carry them only a short distance using this method.

The two-person carry, shown in figure 13-26, can be used in some cases to move a casualty. Do not use it to carry a casualty who has serious wounds or broken bones.

A two-person arm carry that can be used in emergencies is shown in figure 13-27. Two people kneel beside the casualty at the level of the hips, and carefully raise the casualty to a sitting position. Each person puts one arm under the casualty's thighs; hands are clasped and arms are braced. Both people then rise slowly and steadily to a standing position. This carry must not be used to move seriously injured persons.

LAW OF ARMED CONFLICT

The law of armed conflict encompasses all international law regulating the conduct of nations and individuals engaged in armed conflict.

As world tension increases, so does the potential for armed conflict. As members of a force dedicated to prevent such a conflict, we as medical personnel must face the reality of becoming involved. A basic understanding of the principles and applications of the law of armed conflict will help enhance our efforts in providing the best medical care possible while maintaining our moral and ethical obligation.

The terms *combatant* and *noncombatant* need to be defined. A combatant is anyone participating in



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Figure 13-26.—Two-person carry.



Figure 13-27.—Two-person arm carry.

military operations or activities. Generally, this means members of a military force, with certain exceptions, and civilian personnel who are actually engaged in hostilities.

Noncombatants include all others (e.g., civilians not engaged in hostilities, medical personnel, chaplains, other persons you capture or detain, and people who surrender, are captured, shipwrecked, sick, or wounded).

GENERAL PRINCIPLES AND GUIDELINES

The general principles and guidelines include:

- Only combatants are proper targets. Non-combatants must not be attacked.
- Do not cause destruction beyond the requirements of your mission.
- Do not attack protected property (e.g., buildings dedicated to religion, art, sciences, or charitable purposes; historical monuments; hospitals and places where the sick and wounded are collected and cared for; schools and orphanages).
- Do not shoot at the Red Cross.
- Do not hide behind the medical service symbols.
- Do not shoot at a parachute, unless, it is a paratrooper.
- Do not fire at shipwrecked personnel in the water.
- Do not alter your weapons or ammunition to increase enemy suffering.

- Let enemy personnel surrender.
- Treat all captives and detainees humanely.
- Provide medical care for sick and wounded captives.
- Do not take personal property from captives.
- Do not violate civilian rights in war zones.
- Do not steal or burn civilian property.

SPECIAL APPLICATIONS

The law of armed conflict has special applications for medical personnel. These applications include: do not shoot at the Red Cross and do not hide behind the medical service symbols.

Do Not Shoot at the Red Cross

Medical and religious personnel and facilities are usually marked with the Red Cross on a white background. However, some countries use different distinctive emblems to designate their medical service personnel and facilities. For example, Turkey and most other Moslem countries use the Red Crescent. Other countries may use different red symbols on a white background that are not recognized by international conventions as protective symbols; e.g., Israel uses the Red Shield of David. Nevertheless, all persons or objects so marked are to be treated with care and protection.

Whether or not they are marked with a protective symbol, you must not fire at any person or object that you recognize as being a medical or religious person or facility.

Do not fire at hospital ships, medical personnel, chaplains, vehicles (air or ground), buildings, tents, or other facilities used for the care of wounded, sick, shipwrecked, and disabled persons.

Do Not Hide Behind the Medical Services Symbols

The medical service emblems (Red Cross, Red Crescent, and Red Shield of David) are symbols of protection for the wounded, sick, and disabled. In combat, the purpose of these emblems is to protect those who have become casualties and those personnel who are caring for them. It is a serious breach of the rules of war to use these signs to protect or hide military activities. Do not mark your position or yourself with a medical service emblem unless you have been designated to perform only medical duties.

Medical personnel or facilities will lose their special status if they commit injurious acts to the enemy. Furthermore, hospitals and ambulances lose their special protection when using hospitals as an observation post, as a shelter for able bodied combatants, or as a storeroom for arms or ammunition (except ammunition of the wounded until they are transferred), and when using ambulances to fire upon the enemy.

DEFENSE AGAINST CBR WARFARE

As members of the healthcare team, Dental Technicians are trained in the recognition and treatment of chemical, biological, and radiological (CBR) hazards. The purpose of CBR warfare is to produce casualties, disable, or kill the enemy. In the event that an enemy uses any CBR warfare, U.S. forces must be trained to survive. The enemy's aim is to force U.S. forces into protective gear, restrict our capability to perform our mission, and contaminate our combat systems. To survive, it is essential that all Navy personnel have a good working knowledge of all aspects of CBR defense. All personnel should be familiar with self-protection and treatment procedures. We will explain how to recognize CBR agents and to treat casualties.

CHEMICAL WARFARE

Chemical warfare (CW), or "gas warfare," is the deliberate use of a variety of chemical agents in gaseous, solid, or liquid state. These agents are toxic

(poisonous) chemicals that can produce death, injury, or irritating effects.

All service members must take every precaution against becoming chemical casualties. Medical personnel must apply the principles of first aid, treatment, and decontamination to increase their's and their patients' chances of survival.

This section of chemical warfare outlines the basic recognition and treatment principles. For specific detailed treatment, refer to Navy NAVMED P-5041, *Treatment of Chemical Agent Casualties and Conventional Military Injuries*.

Chemical agents attack the body and produce specific damage depending upon the nature of the agent used. The most common types of agents are listed below:

- Nerve agents
- Blister agents (vesicants)
- Incapacitating agents (psychochemical agents)
- Blood agents (cyanogens)
- Choking agents
- Vomiting and tear agents (sternutators and lacrimators, respectively)

NERVE AGENTS

Nerve agents are among the deadliest of chemical agents and may produce rapid symptoms. They include the G and V agents. Examples of G agents are Tabun (GA), Sarin (GB), Soman (GD), and VX.

Nerve agents can be dispersed by artillery shell, mortar shell, rocket, land mine, missile, aircraft spray, and aircraft bomb.

Physical Properties

Nerve agents are colorless to light brown liquids. Most nerve agents are essentially odorless; however, some have a faint fruity or paint odor. In toxic amounts, aqueous solutions of nerve agents are tasteless.

Protection Against Absorption of Nerve Agents

Nerve agents may be absorbed through any body surface. When dispersed as a spray or aerosol, droplets can be absorbed through the skin, eyes, and respiratory tract. When dispersed as a vapor, it is primarily

absorbed through the respiratory tract. Liquid nerve agents may also be absorbed through the skin, eyes, mouth, and membranes of the nose. Nerve agents may also be absorbed through the stomach when ingesting contaminated food or water.

A protective mask and hood should be used to protect the face and neck, eyes, mouth, and respiratory tract against nerve agent spray, vapor, and aerosol. To prevent inhaling an incapacitating or lethal dose, you should hold your breath and put on the mask within 9 seconds of the first warning of a nerve agent presence.

Liquid nerve agents penetrate ordinary clothing rapidly. However, significant absorption through the skin requires a period of minutes. The effects may be reduced by quickly removing contaminated clothing and neutralizing liquid nerve agent on the skin by washing off, blotting, or wiping away. Prompt decontamination (decon) of the skin is imperative. Decon of nerve agents on the skin within 1 minute after contamination is perhaps 10 times more effective than it would be if delayed 5 minutes. A nerve agent on the skin can be removed effectively by using the M291 skin decontamination kit (fig. 13-28). The M291 skin decontamination kit is replacing the M258A1 (fig. 13-29). Upon receipt of the M291, discontinue use of the M258A1 on the skin. Detailed instructions on the use of skin decontamination kits can be found in Navy NAVMED P-5041 and in the kit itself. Liquid nerve agent in the eye is absorbed faster than on the skin and is extremely dangerous; **immediately** irrigate the eye with an abundant amount of water.

Diagnosis of Nerve Agent Poisoning

Nerve agent poisoning may be identified from the characteristic signs and symptoms. It is important that all service members know the following **mild** and **severe** signs and symptoms of nerve agent poisoning. Service members who have most or all of the symptoms listed must **immediately** receive first aid (self-aid or buddy aid).

Self-aid is provided by the person affected by chemical agents. They know who they are, where they are, and what they are doing. They are able to move around freely without assistance. Buddy aid is provided when individuals cannot care for themselves and require assistance.

MILD POISONING (SELF-AID).—Casualties with **mild** poisoning may experience most or all of the following symptoms:

- Unexplained runny nose
- Unexplained sudden headache
- Sudden drooling
- Difficulty in seeing
- Tightness in the chest or difficulty in breathing
- Wheezing and coughing
- Localized sweating and muscular twitching in the area of the contaminated skin
- Stomach cramps
- Nausea with or without vomiting
- Tachycardia followed by bradycardia



Figure 13-28.—M291 skin decontamination kit.

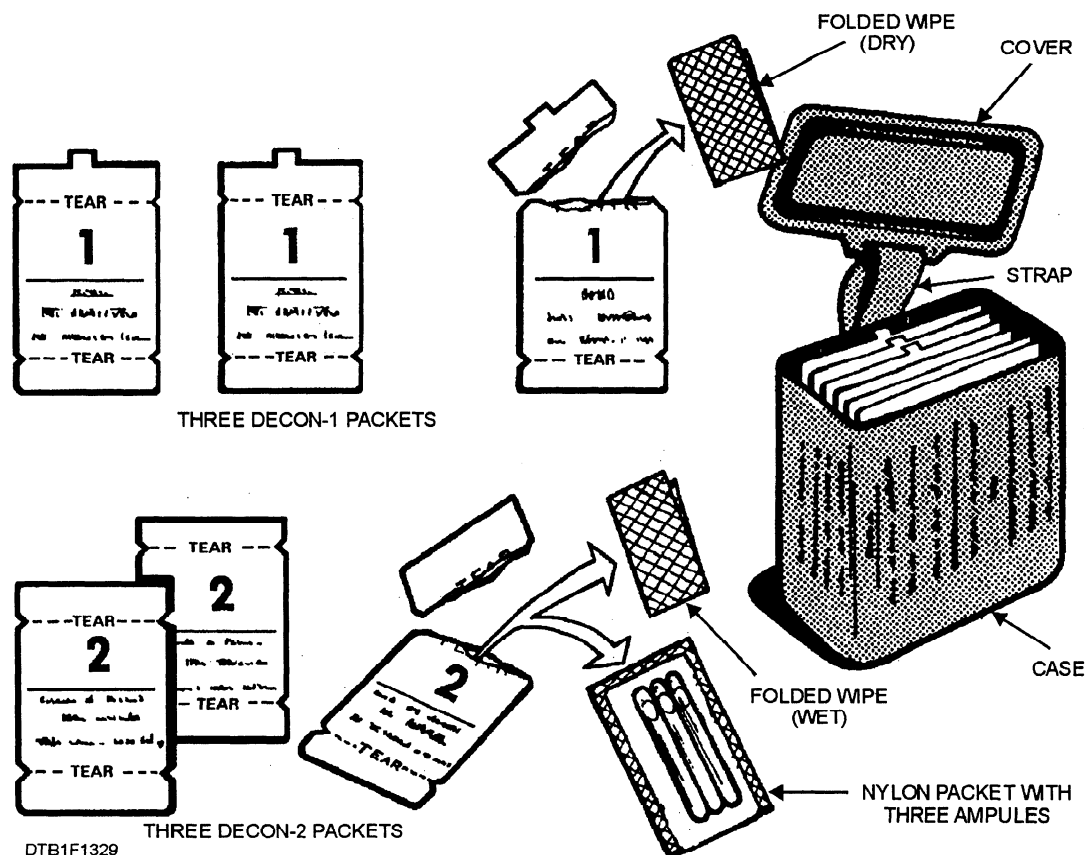


Figure 13-29.—M258A1 skin decontamination kit.

SEVERE SYMPTOMS (BUDDY AID).—

Casualties with **severe** symptoms may experience most or all of the **mild** symptoms, plus most or all of the following:

- Strange or confused behavior
- Increased wheezing and difficulty in breathing
- Severely pinpointed pupils
- Red eyes and tearing
- Vomiting
- Severe muscular twitching and general weakness
- Involuntary urination and defecation
- Convulsions
- Unconsciousness
- Respiratory failure
- Bradycardia

Casualties with severe symptoms **will not** be able to treat themselves and **must receive** prompt buddy aid and follow-on medical treatment if they are to survive.

Casualties with **moderate** poisoning will experience an increase in the severity of most or all of the **mild** symptoms. Especially prominent will be

fatigue, weakness, and muscle contraction. The progress of symptoms from **mild** to **moderate** indicates either inadequate treatment or continuing exposure to the agent.

PREVENTION AND TREATMENT OF NERVE AGENT POISONING

The essential prevention and treatment of nerve agent poisoning include the following actions:

- Donning the protective mask and hood at the first indication of a nerve agent attack.
- Administering **atropine** and **pralidoxime chloride** (2 PAM Cl) as soon as any symptoms are noted.
- Administering convulsant antidote for nerve agents (CANA) to **moderately** or to **severely** poisoned casualties. CANA is also referred to as diazepam.
- Removing or neutralizing any liquid contamination immediately.
- Removing airway secretions if they are obstructing the airway. Airway suction may be needed.

- Establishing a patient airway (for example, with a cricothyroidotomy or endotracheal tube) and administering assisted ventilation, if required. Only qualified personnel can perform these procedures. You should use oxygen if available.

NERVE AGENT ANTIDOTES

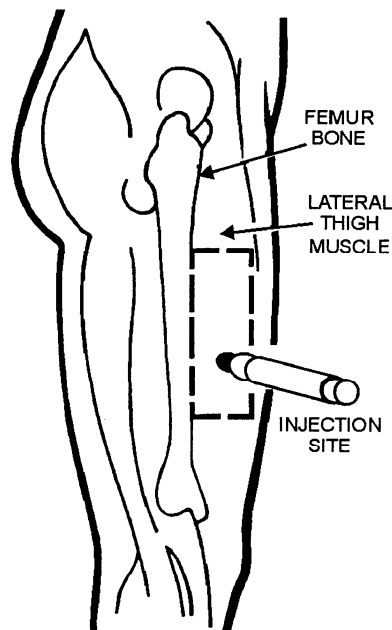
Atropine sulfate and 2 PAM Cl remain essential drugs in the treatment of nerve agent poisoning. When exposed, each member of the Navy and Marine Corps is issued three 2 mg auto injectors of atropine and three 600 mg auto injectors of 2 PAM Cl (fig. 13-30). **Do not** give nerve agent antidotes for preventive purposes **before** contemplated exposure to a nerve agent.

The atropine auto injector consists of a hard plastic tube containing 2 mg (0.7 ml) of atropine in solution. It has a pressure activated coiled spring mechanism that triggers the needle for injection of the antidote solution. The 2 PAM Cl auto injector is a hard plastic tube, which dispenses 600 mg of 2 PAM Cl (300 mg/ml) solution when activated. It also has a pressure activated coiled spring mechanism identical to that in the atropine auto injector. Diazepam (CANA) is administered as a single-dose 10 mg autoinjector.

General Usage Principles for Nerve Agent Antidotes

Certain general usage principles should be followed in the administration of nerve agent antidotes. Complete instructions for the administration of nerve agent antidotes are found on the auto injectors and also in the Navy NAVMED P-5041.

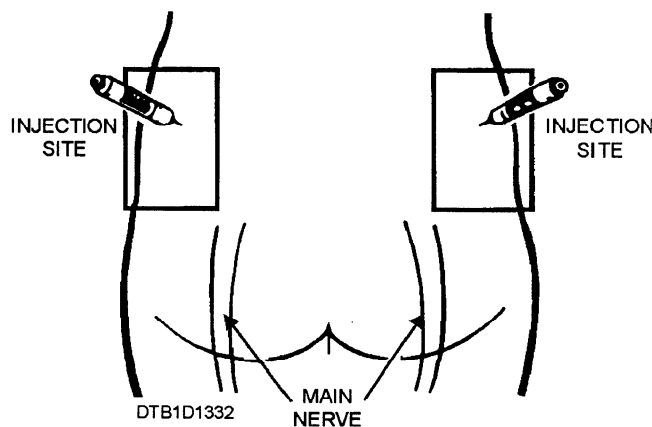
SELF-AID.—If you experience most or all of the **mild** symptoms of nerve agent poisoning, you should **IMMEDIATELY** hold your breath (**without first inhaling**) and put on your protective mask. Then, administer **one set** of (atropine and 2 PAM Cl) injections into your lateral thigh muscle or buttocks as illustrated in figures 13-31 and 13-32. Position the



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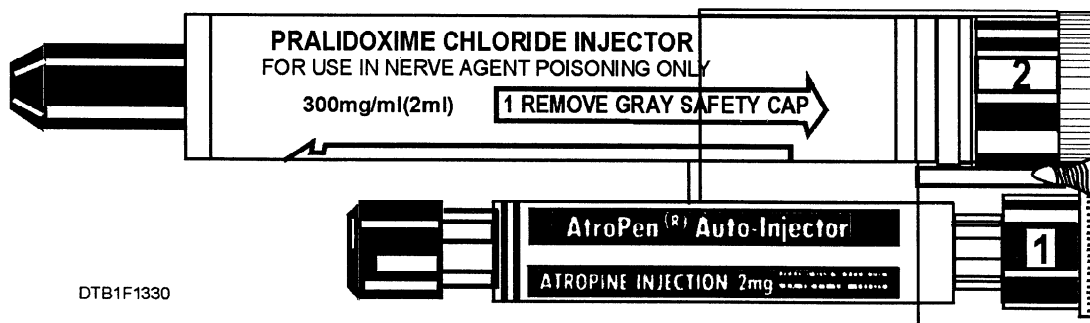
Figure 13-31.—Thigh injection site.

needle end of the **atropine** injector against the injection site and apply firm, even pressure (not jabbing motion) to the injector until it pushes the needle into your thigh (or buttocks). Make sure you **do not** hit any buttons or other objects. Using a jabbing motion may result in an improper injection or injury to the thigh or buttocks.



DTB1D1332

Figure 13-32.—Buttocks injection sites.



DTB1F1330

Figure 13-30.—Nerve agent antidotes.

Hold the atropine injector firmly in place for at **least 10 seconds**. The seconds can be estimated by counting “one thousand one, one thousand two,” and so forth. Firm pressure automatically triggers the coiled mechanism. This plunges the needle through the clothing into the muscle and at the same time injects the atropine antidote into the muscle tissue.

Next, inject yourself in the same manner with the **2 PAM CI** injector using the same procedure as you did for the atropine. This will now complete one set of nerve agent antidotes. Attach the used injectors to your clothing (fig. 13-33).

After administering the **first** set of injections, wait 5 to 10 minutes before administering the **second** set since it takes that long for the antidote to take effect. However, if you are able to walk and know who you are, you **will not need a second set** of antidote injections.

WARNINGS

Giving yourself a second set of injections may create a nerve agent antidote overdose, which could result in incapacitation.

If symptoms of nerve agent poisoning are not relieved after administering one set of nerve agent antidote injections, seek someone else to check your symptoms. A buddy must administer the second and possibly a third set of injections, if needed.

After administering one set of injections, you should decontaminate your skin if necessary, and put on any remaining protective clothing.

BUDDY AID.—If you encounter a service member suffering from **severe** signs of nerve agent poisoning, provide the following aid:

1. Mask the casualty, if necessary. Do not fasten the hood.
2. Administer, in rapid succession, **three** sets of the nerve agent antidotes. Follow the procedures for administration as described previously in the self-aid section.

In addition to administering atropine and 2 PAM CI antidotes for nerve agents as buddy aid, also administer the CANA to a casualty suffering from convulsions. **DO NOT** administer more than one CANA.

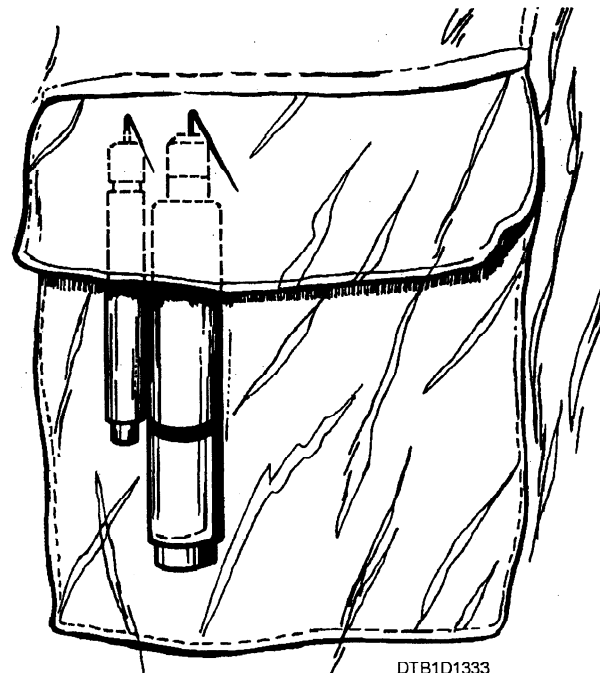


Figure 13-33.—One set of used auto injectors attached to a pocket flap.

NOTE: Use the casualty's own antidote auto injectors when providing aid. Do not use your injectors on a casualty. If you do, you may not have any antidote available when needed for self-aid.

BLISTER AGENTS

Blister agents or vesicants are likely to be used to produce casualties and force opposition to wear full protective equipment. Blister agents are used to degrade fighting efficiency rather than kill, although exposure to such agents can be fatal. More likely they will cause severe blistering and burning of the exposed skin. In either liquid or vapor form, these agents will irritate and blister any part of the body that they touch. Blister agents can be effective in small amounts; a drop the size of a pinhead may produce a blister the size of a quarter. These agents are more effective in hot weather than in cold weather. They first affect the moist parts of the body (bends of arms and knees, armpits, and crotch.) People who are sweating are especially subject to severe burns. If you are exposed to blister agents, changes may not occur immediately. One to several hours may pass before your skin starts to turn red. It may be hours or even days later before blisters appear. However, the damage is inflicted during the first few minutes of exposure. That is why speed in applying self-aid is so important. Self aid is explained later in this chapter.

Damage to the eyes may be more serious than the effects on the skin. Gases and even liquids may irritate the eyes only mildly at first, or there may be no pain at all. In a few hours your eyes may become painful, inflamed, and sensitive to light. Tears and severe pain will follow, with possible permanent injury.

If inhaled into the lungs, blister agents will inflame the throat and windpipe, producing a harsh cough. In a prolonged exposure, this may result in pneumonia and death. Quick detection of blister agents and prompt protection against entry into the eyes, lungs, or skin is vital.

INCAPACITATING AGENTS

Incapacitating agents, or psychochemical agents, can cause mental symptoms. They may also produce physical symptoms such as staggering gait, dizziness, and blurred vision. Some of these agents cause fainting spells and others cause severe muscle weakness. The mental symptoms often resemble alcoholic drunkenness; for example, individuals may act silly, giggle, or become angry and belligerent similar to a “fighting drunk.” Incapacitating agents can also cause hallucinations. Many of these incapacitating gases prevent sleep, causing some people to stay awake for days and be mentally confused for the entire period. These agents do not kill, but they can make a person noneffective. Many of them do not produce effects until several hours after inhalation. The effects of incapacitating agents can last from 8 hours to 4 days.

BLOOD AGENTS

Blood agents or cyanogens get their name from the action they have on your blood. If you inhale these agents, your blood cannot furnish enough oxygen to your body’s cells. As a result, body tissues suffocate and die. Large amounts of blood agents produce rapid breathing and violent convulsions; mild exposure may produce headache, dizziness, and nausea. Blood agents will cause either a speedy death or there will be a complete recovery within a few hours. Like the nerve agents, blood agents may be quick killers. Speed in putting on a mask is essential.

CHOKING AGENTS

The lungs are the target for choking agents. Choking agents do not harm your skin or digestive system but they will actually choke an unprotected person. If large amounts enter the lungs, they will become filled with fluid and death may result from lack

of oxygen. Your protective mask gives you complete protection against all choking agents. The instant you suspect the presence of a chemical agent, carry out these three steps as quickly as possible.

1. Hold your breath; not inhaling before
2. Put on your protective mask
3. Clear your mask (explained later in this chapter)

RIOT CONTROL AGENTS

Vomiting and tear agents, known as “riot control agents,” can produce unpleasant symptoms that usually last for a short time period. When properly used, these agents do not cause death. They are used to control riots, to force people out of buildings, and to capture enemy forces without injury. These agents are also often used for training purposes.

Vomiting Agents

Inhaling vomiting agents (sternutators) can make you ill. A sense of fullness in the nose, severe headache, intense burning in the throat, and tightness and pain in the chest are the general symptoms. These symptoms are followed by uncontrollable coughing, violent sneezing, nausea, and vomiting.

The symptoms may be delayed for several minutes. If you should inhale a vomiting agent before putting on your protective mask, you might become ill later. **You must wear your protective mask as long as the agent is present. Pull it away from your chin during actual vomiting, but do not take it off** The mask offers adequate protection against vomiting agents. The effects of vomiting agents will usually disappear in 20 minutes to 2 hours.

Tear Agents

Tear agents, or lacrimators, are the least toxic of the six groups of chemical agents. These agents may be used in civil riots to disperse the crowds or to squelch prison riots. The vapors of tear agents can produce a sharp, irritating pain in the eyes resulting in an abundant flow of tears. There is no permanent damage to the eyes and the effects wear off quickly. For a short period, you will not be able to see clearly. The protective mask, used before tear agents get into your eyes, will give complete protection. Some of the new tear agents can cause runny noses, severe chest pains, nausea, and vomiting.

DECONTAMINATION

The guiding principles in personal decontamination are to avoid spreading contamination, to clean contaminated areas, and to manage casualties without aggravating other injuries.

The decontamination of chemical hazards can be accomplished by removing, neutralizing, or destroying the chemical warfare (CW) agents. The purpose of personal decontamination is to remove toxic substances from your body or personal equipment before serious injury occurs. Examples of these principles are as follows:

- Removing: pinch-blotting the agent from your skin
- Neutralizing: using the M291 or M258A1 decontamination kit to make the agent harmless
- Destroying: burning or burying a contaminated cloth that was used to blot off the agent

Self-Aid Decontamination

Self-aid or personal decontamination is solely your responsibility. If tactical conditions at the time of exposure require you to keep fighting, you must decontaminate at the earliest opportunity.

There are definite time limits after which self-aid becomes useless, so immediate personal decontamination is important if you are exposed to CW agents. Decontamination by either neutralizing or removing the agent, or both, should be carried out before serious injury occurs. You may have to rely on whatever you have on hand to remove these agents from your skin, eyes, or equipment. If liquid nerve or blister agents touch any part of your body, you must remove them rapidly, for these agents can quickly penetrate the skin. If you are caught without the M291 or M258A1 decontamination kit or soap and water, then use anything that is available. It may be mud, gun oil, or even urine. A crude remover may get off only two-thirds of the agent, but it is better than nothing. When you are removing any agent from your body with soap and water, scrub your body just as vigorously as a physician scrubs his/her hands before an operation. Exposed regions and hairy areas should be given extra attention.

Speed is essential in self-aid. You may not know whether you have been contaminated with liquid nerve or blister agents, the following standard procedures must be observed to prevent injury from liquid agents.

- Decontaminate the eyes and face, if necessary
- Put on a protective mask
- Use the M291 or M258A1 kit for decontamination of the skin
- Throw away any contaminated clothing (or cut away the contaminated parts)
- Use the antidote injector **only** if you experience the symptoms produced by **nerve agents**

The self-aid procedures for specific agents given later should be employed if the agent has been identified.

Skin Decontamination

If chemical agents contact your skin, you must take immediate action to decontaminate yourself. Start the skin decontamination (or decon) within 1 minute of becoming contaminated. Some toxic chemical agents, especially nerve agents, are rapidly absorbed by the skin and can kill in minutes.

If you do not have a skin decon kit, chemical contamination may be pinch-blotted from the skin with a cloth and then flushed with water. Pinch-blotting is better than rubbing because it limits the spread of contamination. Soap, if available, can also be used to wash the agent from the skin. Washing with soap and water (or hot water) is the next best method for toxic agent decon. This method is not as effective as using the decon kits.

Self-Aid for Blister Agents

Blister agents are usually released as gases and have the odor of garlic, fish, or geraniums.

FOR THE EYES.—If a blister agent gets in your eyes, treat them instantly. Every second counts. If there is no pain in your eyes, treat them with water only (as described next). If there is pain in your eyes, flush the eyes with water and seek medical aid immediately.

- Flush the eyes with water. The best method is to tilt the head back so that the eyes look straight up. Pull the lids apart with the fingers of one hand. With the other hand, pour water slowly into the eyes. Try to regulate the flow of water so the flushing lasts not less than 30 seconds and not more than 2 minutes.

- **Speed** in decontaminating the eyes is **absolutely essential**. Decontamination will be very effective for mustard agents if it is applied within the first few seconds; after 2 minutes it has little benefit.

SKIN AND CLOTHING.—The following measures are recommended for decontamination of the skin and clothing.

- Use the M291 or M258A1 decontamination kit.
- If the contamination is discovered late, when no liquid blister agent is visible and reddening of the skin has developed, wash the contaminated area with soap and water. The decontamination kit will not be helpful at this stage.
- Cut off hair that becomes contaminated with the liquid blister agent. Decontaminate the exposed scalp with the M291 or M258A1 decontamination kit.
- If in a secure place, remove clothing that is contaminated with liquid blister agents. This applies to both ordinary clothing and to impregnated protective clothing. Decontaminate small areas with soap and water. If contamination is too great to handle with the equipment you have, cut out the contaminated parts. Do not wear the clothes; when you are able, boil them with soap and water. This will make them safe to wear.

Self-Aid and First Aid for Incapacitating Agents

By the time a victim of an incapacitating agent exposure realizes something is wrong, the individual may be too confused to handle his/her own decontamination. Take these cases to medical immediately. These victims may not be responsible for their actions.

Self-Aid for Blood Agents

Blood agents are usually released as a gas and have an odor of bitter almonds. As a victim of blood agent exposure, you must first put on your mask and then avoid any unnecessary movements. The medical officer or Hospital Corpsman will give you amyl nitrate to inhale. Squeeze the ampule until it pops. Insert 2 ampules inside the face piece of your mask under the eye lens. Repeat this at intervals of 3 or 4 minutes until normal breathing returns or until a total of 8 ampules are used.

Self-Aid for Choking Agents

Upon detecting any choking agent in the air, put on your protective mask **immediately**. The odor is like new-mown grass or hay. Continue with your combat duties unless you have a difficult time breathing, feel

nauseated, or vomit. In those cases, take it easy and avoid unnecessary movement.

Self-Aid for Vomiting Agents

Vomiting agents are usually released as a gas and have the odor of burning fireworks. For protection against vomiting agents, put on your mask and wear it in spite of coughing, sneezing, excessive salivation, or nausea. If necessary, briefly lift the mask from your face to permit vomiting or to drain saliva from the facepiece. Clear your mask each time you adjust it to your face and before you resume breathing. **Carry on with your duties as vigorously as possible**; this will help to lessen and to shorten the symptoms. Combat duties can usually be performed in spite of the effects of vomiting agents.

Self-Aid for Tear Agents

Tear agents are usually released as a gas and have the odor of apple blossoms, chloroform, or pepper. If a liquid or solid agent has entered your eyes, force your eyes open and flush them with water. **To clear your mask, you should put it on, cover the outlet valve, and blow hard until clear.** When it is safe to remove your mask, blot away tears, but do not rub your eyes. Then, face into the wind if possible.

BIOLOGICAL WARFARE

Biological warfare (BW) is the deliberate use of germs or their poisonous products to produce disease, injury, or death in man, animals, or plants. It is the intentional use of biological agents that makes BW dangerous.

CHARACTERISTICS OF BIOLOGICAL WARFARE AGENTS

Germs are alive. Behaving in the manner of other living things, they multiply, breathe, eat, grow, and die. Thus they depend on moisture, food, and certain limits of temperature for life and growth. When their surroundings do not provide suitable conditions, they die. Most germs are killed by boiling water, adding chlorine tablets to water, cooking food, exposing them to sunlight, and using soap and water. BW agents or their poisonous products attack your body by the same routes as CW agents—through your nose, mouth, or skin.

In contrast to CW agents, the presence of BW agents cannot be detected by the physical senses or by chemical detectors. Their presence or identity can be determined only by laboratory examination of air samples or contaminated objects. The time lag between exposure to BW and the onset of symptoms will usually be a matter of days, rather than hours. All persons will not be similarly affected even though exposed to the same dosage of BW agents. Some may escape disease entirely, some may have a very mild attack, and some may become seriously ill.

PROTECTIVE MEASURES

Defense against BW is not simple or easy. Individual protection against a BW attack includes the use of protective equipment. The protective equipment used for defense against CW may also be used for BW defense. Your first line of defense against BW is the natural resistance of the body (the immune system) and maintaining your body in the best possible physical condition. A high standard of personal cleanliness and careful attention to sanitation are your best assurance against the spread of disease. Such steps are supported by the immunizations you receive periodically.

The inhalation of airborne germs is considered to be the greatest potential hazard in BW. Your protective mask is an important component of defensive equipment. A properly fitted mask, which has been kept in good condition, will greatly reduce the danger of inhaling infectious material present in the air. Since you cannot detect the presence of biological agents, you may be ordered to use your protective mask and equipment until the danger has passed. Your commanding officer will base his/her decision upon information received from intelligence reports and the advice of his/her technical staff or higher headquarters.

To produce disease, germs must actually gain entrance into your body. When germs collect on your skin, they may be transferred to a portal of entry, through your nose or mouth. Cuts or open sores are an invitation to germs trying to enter your body. Make sure you keep cuts bandaged. Any type of clothing will provide some protection against BW agents. The degree of protection depends upon the size of the pores in the fabric and the number of layers of clothing being worn. To keep out germs and disease-bearing insects such as mosquitoes, fleas, and ticks, it is important to fasten the shirt and jacket collar, roll down sleeves and button cuffs, and tie down all other clothes. A special uniform (not discussed in this book) used for

protection against CW agents gives a higher degree of protection against BW agents than ordinary clothing.

DECONTAMINATION

The extent to which decontamination can be accomplished following exposure to BW agents depends upon the existing tactical situation and the facilities available. Each person is responsible for carrying out personal decontamination measures at the earliest opportunity.

If you are exposed to BW agents, scrub yourself thoroughly with soap and water as soon as the combat situation permits. Give special attention to your face and hands. To remove dirt from under your nails, use a fingernail brush. Also, brush your teeth frequently. Carefully remove your contaminated clothes and take a bath or shower. All washable clothes polluted with germs should be scrubbed at the first opportunity.

Always be careful about the food and water you consume in combat. If you are told that a BW attack has occurred, be **extremely** cautious. One of the easiest ways to get biological agents inside your body is to swallow them along with your food and water. Defense against BW includes:

- Remember the "BIO" sign; it means the area is contaminated with biological agents.
- Do not pick and eat fruits or berries.
- Do not chew grass or leaves.
- Do not eat native food or drink native beverages. They may be contaminated intentionally or unintentionally.
- Do not take souvenirs.
- Consume only beverages received from military sources.
- Do not bathe in lakes or ponds.
- Do not touch animals.

Survival Tips for Biological Warfare

The following survival tips are recommended for your protection:

- **REPORT SICKNESS PROMPTLY.** If you become ill, notify medical immediately.
- **KEEP YOURSELF AND YOUR LIVING QUARTERS CLEAN.** Do not foster the growth of germs by making it easy for them to multiply. Germs

have trouble living in clean places. If you keep clean, the odds increase that you may not become ill.

- **DO NOT NEGLECT PREVENTIVE MEDICINE.** Take pills, shots, or vaccinations at the appropriate time.

- **KEEP YOUR NOSE, MOUTH, AND SKIN COVERED.** When BW agents are known or suspected to be present, make sure that you use all of your protective equipment.

- **KEEP YOUR FOOD AND WATER PROTECTED.** Bottled or canned foods are safe after a BW attack if the seals are not broken. Food in the open will be contaminated. If in doubt, discard the food. Always clean cans, packages, etc., with soap and water before opening.

- **BE ALERT FOR ANY SIGNS OF A BW ATTACK.** Any clues such as new or unusual types of shells or bombs, strange material sprayed by aircraft, smokes or mists of unknown nature, or other strange substances should be reported to your commanding officer immediately.

- **WATCH OUT FOR “BOOBY TRAPS.”** The enemy may challenge your discipline and self-control by making available all sorts of tempting items of food. To eat or drink these contaminated items may mean death.

TREATMENT OF CASUALTIES

There are no self-aid measures for the diseases that are caused by BW agents. It may be a matter of days before it can be determined what types of BW agents are present. Medical personnel will direct the decontamination of these casualties.

RADIOLOGICAL WARFARE

Radiological warfare (RW) is the deliberate use of radiological weapons to produce injury and death. The explosion of a radiological weapon, similar to that of an ordinary bomb, causes damage by the heat and blast liberated at the time of detonation. Nuclear radiation is emitted when the bomb explodes. This radiation may also be released by particles called radioactive fallout.

EFFECTS OF RADIATION

The first indication of an overdose of radiation probably will not occur for several hours or days. At that time, you will probably become ill with nausea and

vomiting. The length of time it takes for these symptoms to appear generally depends on the extent of radiation exposure. The larger the dose, the quicker you may become ill.

TYPES OF EXPLOSIONS

An **air burst** is a nuclear explosion that causes damage by heat and blast. The initial radiation from an air burst occurs within the first minute after the blast and disappears quickly.

A **ground or surface burst** is one that is low or on the ground surface. It causes less damage from the heat and blast. This type of burst produces radioactivity fallout or **residual radiation**, which lasts for a long time period.

PROTECTIVE MEASURES

To protect yourself against RW, you must know how to protect yourself during nuclear attacks and be familiar with the kinds of equipment available for your protection.

Self-Protection

Speed in taking cover is vital; you must protect yourself from the heat and the blast. Remember that the initial radiation after an explosion can be very dangerous. As with any explosion, the more material or distance between you and the burst, the safer you are. Falling flat and covering your face is better than standing.

Protective Clothing

Any type of clothing that covers you gives some protection against radiological weapons. To protect the clothes you are wearing from radioactive materials, an extra protective covering is recommended.

Gloves and Masks

When you enter a radioactive area, you must wear gloves to protect your hands. Touching radiographic material with bare hands may result in serious burns. You should wear a protective mask or a dust respirator in the affected area to prevent inhaling radioactive materials. The point to remember is never inhale radioactive material. Serious injury and radiation sickness may result.

DECONTAMINATION

If you suspect that you are contaminated, or if detection equipment indicates you are, report to a personnel decontamination station. Outer clothing will serve as a trap for most radioactive contamination. By taking off your clothes, you may remove most of the contamination.

The usual procedure at the personnel decontamination station is as follows: discard clothing and equipment as directed. Enter the shower; then bathe, using plenty of soap and warm water. In scrubbing the entire body, give particular attention to the hair, fingernails, body creases, and ears. After the shower, you will be directed to a monitor who will check you with a radiation detector. If any contamination remains, you must shower again. If no contamination is detected, you may proceed to the dressing room for a new issue of clothing and equipment.

Since food and water are especially subject to contamination, avoid consuming uncovered food and water if they are in a radioactive area. Canned foods and covered water supplies may be consumed with safety, even after the outside of the containers are decontaminated.

Self-Aid

If the situation does not permit you to go to a decontamination station, you must be able to remove most of the radioactive material with whatever you have on hand. If you become heavily contaminated, the following measures are recommended:

1. Remove your outer garments. Shake them vigorously or brush them off. Be sure that the clothing is held downwind. This will remove most of the radioactive material, unless it is wet and muddy
2. If it is too cold or wet to remove your clothing, brush or scrape them carefully.
3. The same procedure should be used to decontaminate your equipment.

Treatment of Casualties

In the case of an air burst explosion, you may administer first aid to those casualties who received injuries from nuclear explosions, without fear of becoming contaminated by the casualties. If the weapon has been detonated close to the ground, both you and the casualties may have some radioactive fallout on your skin and clothing. You must treat for hemorrhage, shock, wounds, fractures, burns, and other injuries.

